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EDITORIAL.

Experimental Work on Pineapples.

In the *Malayan Agricultural Journal* for October 1933, we printed an account of the investigations on pineapples which had been carried out since the establishment in Singapore of the Pineapple Experiment Station of the Department of Agriculture. In this issue we present to our readers the latest available information regarding the progress of experimental work and the results obtained at the same Station.

These experiments have advanced our knowledge in respect of both manuring and planting distances, but the results so far obtained have served to emphasize the need for and indicate the direction towards which further experiments should be directed, rather than given any data approaching finality on the two problems. In addition, a satisfactory beginning has been made with the selection of suitable types of fruit for canning, and some work has been commenced on hybridization.

The necessity for improving and maintaining the quality of the Malayan pineapple is a very real one, in view of the desirability of ensuring that the popularity enjoyed by the canned article in the cheap English market may not be forfeited.

In addition to the specific problems mentioned above, work is in progress which is designed to provide information on the prevention of soil erosion (a serious problem in sole crop pineapple cultivation on hilly lands), on the period over which pineapples can be grown profitably before transplanting becomes necessary, and on the effect on size, quality and flavour of different types of soil and of various mixtures of manures.

The importance of this work is emphasized in view of the proposals to institute a Malayan Mark Grading Scheme for canned pineapples allied to the scheme which has proved so successful in the United Kingdom. We wish to draw the attention of our readers to the fact that the publication of this article has been unavoidably delayed owing to the necessity of awaiting the return from leave of the author.

Original Articles.

FURTHER EXPERIMENTAL WORK ON PINEAPPLES

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The last report of progress made at the Pineapple Experiment Station, Singapore, published in the *Malayan Agricultural Journal* No. 10, Vol. XXI, (October, 1933), contained reference to a number of experiments laid down on pineapples as a sole crop and detailed the results thereof up to the end of March, 1933. Since that time, further information of considerable interest has been obtained, and the experiments have been extended and revised in the light of the knowledge gained. This report concerns itself mainly with the position as in October, 1935, and for convenience of reference is divided into the following main sections:—

I. Record of experiments and results obtained therefrom.
II. Summary.
III. Conclusions and recommendations.

I. Record of Experiments and Results obtained therefrom.

During the period from April, 1931, to the end of September, 1935, investigations and experiments dealing with the points listed below were laid down, some of which were still in progress at the end of that period, whilst others have been replaced by revised experiments.

(1) Manuring.
(2) Planting distances.
(3) Cultural treatments.
(4) Green manuring.
(5) Varieties.
(6) Close-distance planting.
(7) Artificial selection.
(8) Manuring with close planting.
(9) Cross fertilization.
(10) Stem slice method of propagation.
(11) Ferrous sulphate spraying.
(12) Drying of suckers prior to planting.
(13) Fruit characteristics of the Singapore Canning pineapple.
(14) Minor investigations.

It will be seen from this list that the scope of the investigations at the Pineapple Experiment Station has been considerably extended since the date of the last report. Some of these investigations have yielded results of considerable value to the Malayan pineapple industry, as will be observed from the following discussions:

Experiment No. (1). Manurial Experiment.

This experiment consisted of 72 plots each 1/20th acre in size, arranged as three randomized blocks, with 12 manurial treatments, each repeated six times. Each treatment appeared twice in each of the three blocks. The usual planting distance for Malaya, 5 ft. x 2½ ft. single row, was employed and Singapore Canning pineapples were planted. The area was planted in April, 1931; one half of the manurial treatment was applied in September, 1931, and the other half in May, 1932 after which no more fertilizer was applied until June, 1934, when the experiment was revised. Fruiting commenced in August, 1932, and a statistical analysis of the results was carried out on the results of the first crop in March, 1933.

The treatments applied in this experiment were as follows:—

Treatment No.	Treatment	Quantity per acre
1.	Lime only	½ ton
2.	Lime	½ „
	Sulphate of ammonia	100 lbs.
	Superphosphate	300 „
	Sulphate of potash	100 „
3.	Lime	½ ton
	Sulphate of ammonia	100 lbs.
	Superphosphate	300 „
	Sulphate of potash	100 „
	Magnesium sulphate	240 „
4.	Control—no manure	
5.	Sulphate of ammonia	100 lbs.
	Superphosphate	300 „
	Sulphate of potash	100 „
6.	Sulphate of ammonia	100 „
	Superphosphate	300 „
	Sulphate of potash	200 „
7.	Sulphate of ammonia	100 „
	Superphosphate	300 „
	Sulphate of potash	100 „
	Magnesium sulphate	240 „
8.	Superphosphate	300 „
	Sulphate of potash	100 „
9.	Sulphate of ammonia	100 „
	Superphosphate	300 „
10.	Sulphate of ammonia	100 „
	Superphosphate	100 „
11.	Rotted pineapple refuse	10 tons
12.	Cattle manure	10 „

Analysis of the results in March, 1933, showed that all treatments except 1, 10 and 11 were significantly greater in yield then the control. The greatest increase was given by treatment 6 (sulphate of ammonia 100 lbs., superphosphate 300 lbs., and sulphate of potash 200 lbs.), but treatment 5 (the same, but with half the amount of potash) was also very effective. In addition it was shown by the results that there was a definite response to the application of phosphates.

Two further analyses were made, one for the period June, 1932 to April, 1934, and the other for the period May, 1934 to July, 1935, results being detailed in Tables I and II respectively. Attention is drawn to the fact that in these tables yields in weight of fruit per acre are given, which were not calculated previously and therefore do not appear in the earlier article.

Table I.

Period June, 1932 to April, 1934.

Treatment No.	Mean weight per pine (lbs.)	Mean No. per plot (1/20th acre)	Mean No. per plot per annum	Yield per acre per annum (tons) calculated.
1	2.922	114	60	1.550
2	2.882	157	82	2.107
3	3.158	172	90	2.533
4	2.980	141	73	1.960
5	3.041	173	90	2.455
6	2.828	156	81	2.057
7	3.040	167	86	2.367
8	3.111	178	92	2.580
9	3.024	161	83	2.264
10	2.880	145	75	1.948
11	2.922	147	76	2.000
12	2.836	157	82	2.075

	Weight	Numbers
Standard error	0.285 lbs.	28
General mean	2.973 „	154
Significant difference between any treatment and control (P = 0.10)	0.298 „	29
Significant difference between treatments (P = 0.05) ...	0.377 „	35

Table II.

Period May 1934 to June 1935.

Treatment	Mean weight per pine (lbs.)	Mean No. per plot (1/20th acre)	Mean No. per plot per annum	Yield per acre per annum (tons) calculated.
1	1.761	136	109	1.708
2	1.757	137	110	1.720
3	1.633	139	111	1.620
4	1.733	149	119	1.841
5	1.563	157	126	1.750
6	1.843	171	137	2.245
7	1.776	154	123	1.924
8	1.810	173	138	2.500
9	1.757	144	115	2.020
10	1.896	157	125	2.120
11	1.846	157	125	2.064
12	1.824	146	117	1.900

	Weight	Numbers
Standard error	0.185 lbs.	21
General mean	1.794 „	152
Significant difference over control	0.188 „	22
Significant difference between treatments	0.238 „	28

Table I indicates that to date all treatments except 1, 10 and 11 were significant over control in respect of yield in number of pines. It is worthy of note that the highest yield recorded, *viz.* 2.58 tons per acre for treatment 8 is a very low yield as compared with the yields obtained in other pineapple-growing countries, notably Hawaii, and is also appreciably lower than normal yields from Malayan pineapple estates. This fact points clearly to the necessity for considerable alteration in the present method of planting, since the widely spaced single row method does not provide a sufficient number of plants per acre. This single row planting is a continuance of the method originally employed for catch crop pineapples.

The general mean of the weights of individual fruits yielded over the period under examination is also interesting. No significant difference between treatments is shown by the figures in column 2 of Table I, but the general mean is worthy of note by factory owners and by growers, since it shows that the average weight of the individual fruits yielded in the first two years of fruiting was approximately 3 lbs. The effect of manuring, in the quantities used in this experiment, on the *size* of the fruit was apparently negligible, and the fruit steadily decreased in size from the time of second crop onwards.

A further point shown by this experiment up to April, 1934, is that 18 months after the date of application, the fertilizer had ceased to have any appreciable effect on the yield. This is shown by the graph of the monthly yields for treatments 3, 4, 5 and 8.

It is apparent also from this graph that the chief effect of the fertilizers applied was the earlier fruiting produced in the manured plots, and particularly in those which received phosphate in the fertilizer mixture. After a period of some 18 months, however, all treatments showed a more or less proportionate decrease in yield, though significant differences still existed between some treatments.

It should be noted that the analysis carried out for the period up to the end of March, 1933 (*vide Malayan Agricultural Journal*, October, 1933) coincided with the time at which the yield in numbers of fruit of the fertilized plots already showed a considerable increase, whereas the control plots had not yet started to produce their main crop. The graph also indicates that this state of affairs was later reversed, the control plots in July and August, 1933, yielding considerably more than the fertilized plots. The true increase in yield over the control is indicated only by the period March—June, 1933, and the large increases over the control shown in yield figures up to the end of March, 1933, are misleading, and indicate the necessity for recording results of experiments of this type over a considerable period before reliable conclusions can be drawn therefrom.

An analysis for the period April, 1933 to May, 1934, was also carried out and showed that only the yields of treatments 3, 5 and 8 were significant over the control. All these treatments contained nitrogen and phosphate. It was further shown by this analysis that the cost of the fertilizer would be repaid if the fruits realised $2 per 100, but the average weight of the fruits produced during this period had fallen to such an extent as to make it improbable that these prices would be obtained. A revision of the experiment was then made and in June, 1934 plots in treatments 1, 6, 8, 9, 10, 11 and 12 were re-fertilized at the original full rate per acre. Plots in treatment 2 and treatment 5 were left unmanured, while plots in treatments 3 and 7 received 300 lbs. of superphosphate per acre, and 300 lbs. of rock phosphate per acre, respectively. The purpose of this revision of the experiment was two-fold. It was firstly designed to ascertain if the

plants could be brought back to a state of fruitful production by the application of fertilizers, and secondly if phosphate alone was sufficient to bring about an economic increase in fruit production.

A further analysis of the results for the period May, 1934 to July, 1935, the results of which are summarized in Table II, showed that the yield of treatments 6 and 8 only are significant and these are only just so—in numbers of fruit. No significant differences for weight of fruit were found. An important point to note is that during this period a large drop in average weight per fruit occurred, from 2.973 to 1.794 lbs., showing that re-fertilizing in the amounts applied in this experiment does not, apparently, increase the size of the fruit.

Experiment No. (2). Planting Distance Experiment.

An experiment designed to yield information regarding suitable planting distances for pineapples as a sole crop was laid down in 1931, and consisted of twenty-four 1 sq. chain plots containing the following planting distances.

I. Double row 5 ft. x 2 ft. x 2 ft.
II. Double row 5 ft. x 2½ ft. x 2½ ft.
III. Double row 5 ft. x 3 ft. x 3 ft.
IV. Single row 5 ft. x 2½ ft. (control).

Each of these treatments was repeated six times. Singapore Canning pineapples were planted throughout, and at the outset no fertilizer was applied. Later it became apparent that fertilizing would be necessary on all plots, and one half of the plots were dressed with a mixture consisting of sulphate of ammonia 100 lbs., basic slag 300 lbs., and sulphate of potash 100 lbs., at the rate of 500 lbs. per acre, the remainder receiving the same mixture but at double the rate, *i.e.* 1,000 lbs. per acre. These fertilizers were applied in two half dressings in March, 1932 and October, 1932.

Subsequent growth was much improved and an analysis of the yield figures, in numbers of fruit, carried out in March, 1933, showed that the yields of the first two treatments only were significantly greater than the control, *i.e.* double row 5 ft x 2 ft. x 2 ft. and double row 5 ft. x 2½ ft. x 2½ ft. It was found during the course of this experiment that considerable soil differences between plots existed, and this fact detracted from the value of the results obtained. The only result that can be said to be of value is the significant increase in numbers of fruit in the closer planted plots. Any difference that might have appeared under normal conditions between the two manurial treatments was effectively disguised by the soil variations. It was found also in this experiment that numbers of fruit and weight of fruit tended to be in inverse proportion—or, in other words, that the closer planting gave a smaller fruit. This clearly indicates that there is a limit to the number of

plants per acre for a given set of soil conditions, in so far as the weight of fruit produced from a given area is concerned. A summary of the results is given in Table III.

This experiment was discontinued in September, 1934; the plants were all removed and the area thoroughly ploughed. A revised set of experiments has since been laid down on this area, and will be referred to under a later section of this report.

Table III.

Yield per Plot and per Acre from Planting Distance Experiment.

	Double Row 5′ x 2′ x 2′	Double Row 5′ x 2½′ x 2½′	Double Row 5′ x 3′ x 3′	Single Row 5′ x 2½′
No. of fruit per plot (1/10th are) ...	447	420	309	341
Mean weight of fruit per plot (lbs.) ...	3.029	3.025	3.196	3.225
Calculated yield in tons per acre per annum	3.022	2.835	2.203	2.445

	Weight	Numbers
Standard error	0.136 lbs.	31
General mean	3.125 „	378
Significant difference (P=0.05)	0.158 „	39

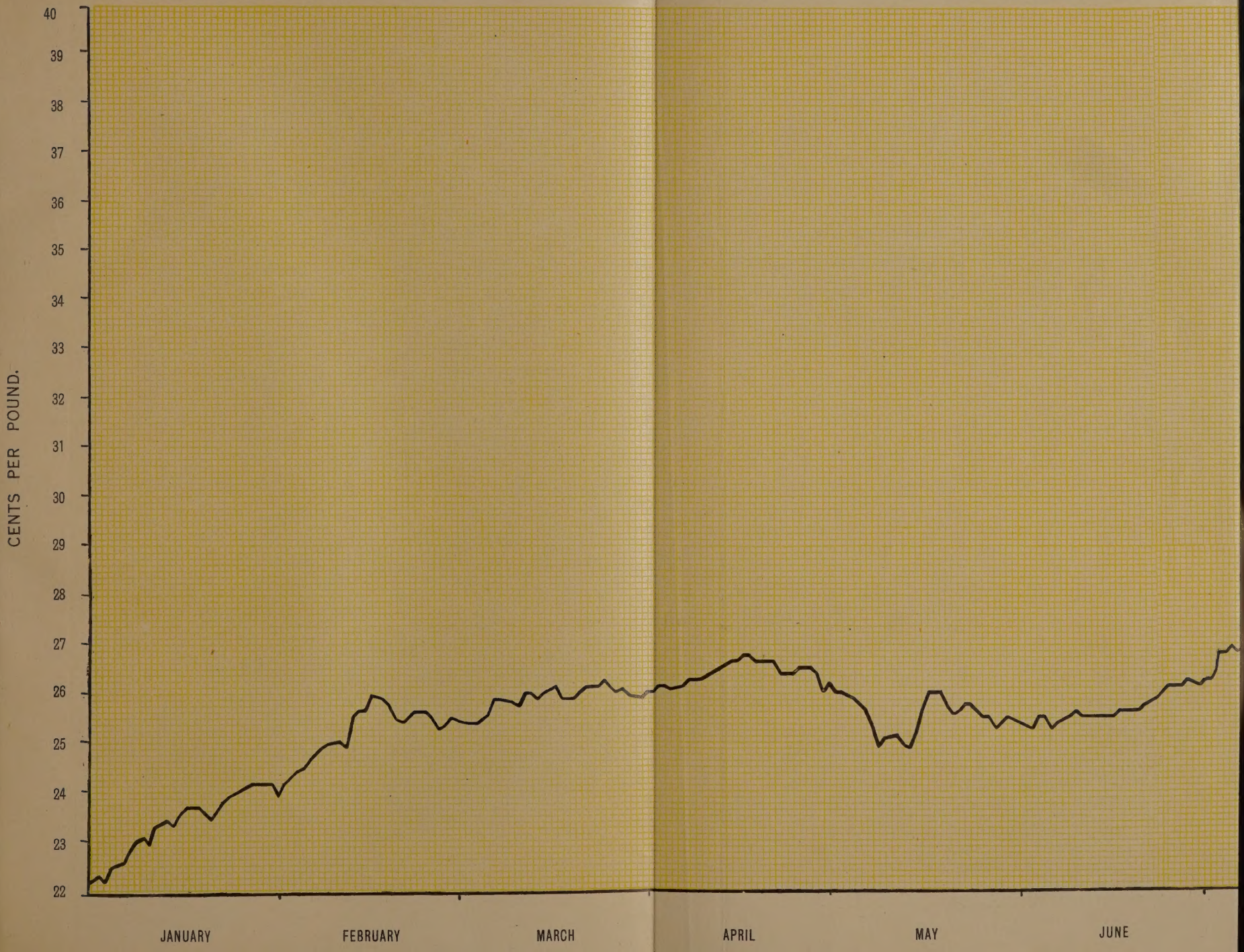
Experiment No. (3). Cultural Treatment Experiment.

This consisted of a trial of five different cultural methods for pineapples as a sole crop, the experiment being laid out on ten 1 sq. chain plots, each treatment being repeated twice. The treatments were as follows:—

I. Unweeded.
II. Mulched with pineapple refuse (factory waste).
III. Clean weeded.
IV. Forked once per annum.
V. Mulched with "Pabco" paper.

RUBBER

SINGAPORE DAILY MARKET



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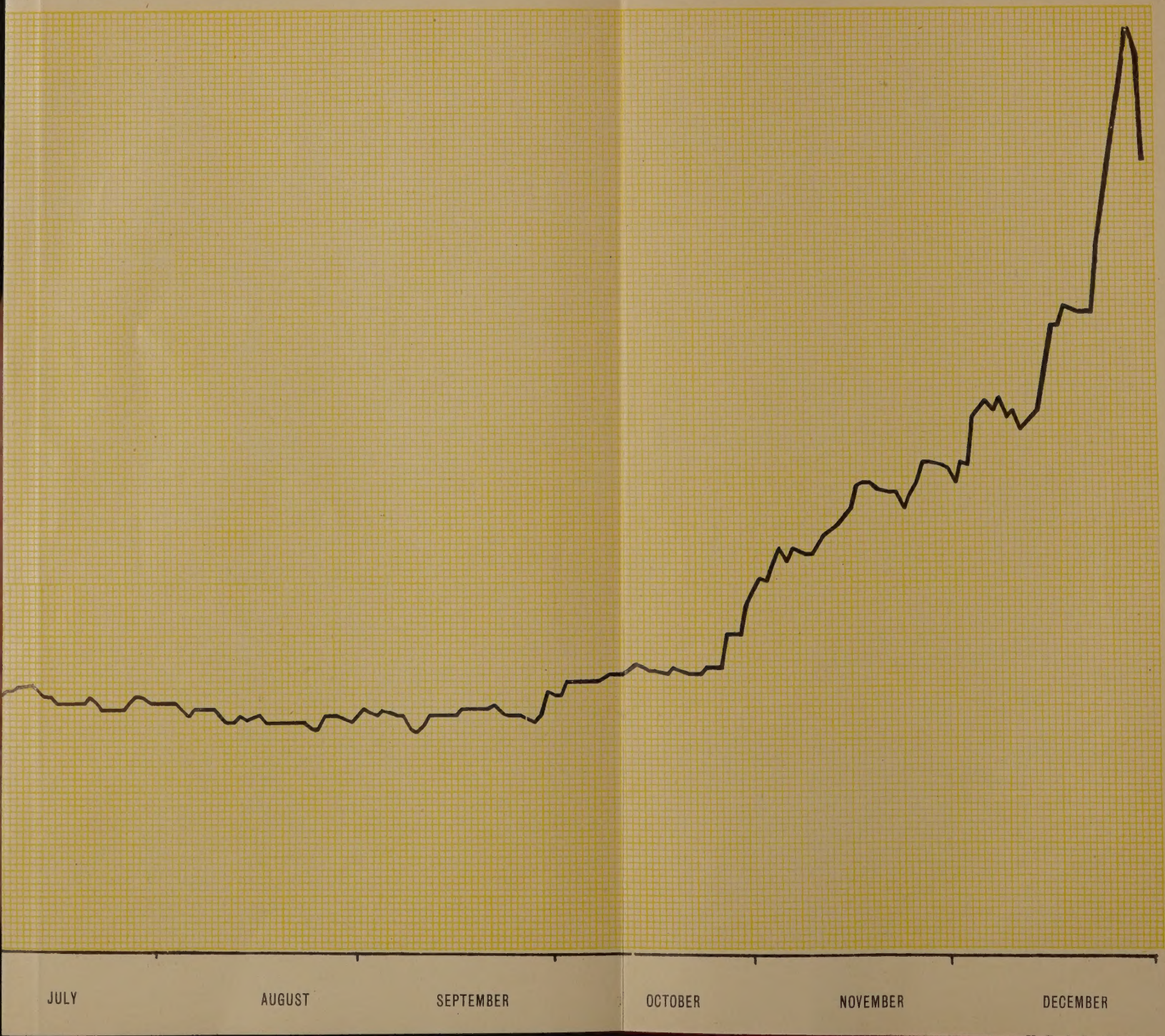

The experiment was started in April, 1931, and was continued until May, 1934. A statistical analysis of the results, carried out in August, 1932, showed that the Pabco mulch gave significantly greater yields than all other treatments. Pineapple refuse mulch gave significant increases over all other treatments except Pabco mulch, but no significant difference was given between forking once per annum, and the unweeded plots. The yields of the clean weeded plots were significantly greater than those of the unweeded plots.

It was also shown by the results that Pabco mulch paper, though beneficial to the plants and very useful for conserving the soil, was prohibitive in cost, while the high moisture content of pineapple refuse rendered it uneconomic to use it as a mulch because of the high cost of transport. It is possible that where a pineapple factory or cutting shed is operated on a plantation, pineapple refuse would be economic as a mulch, but this material could not otherwise be recommended.

In June, 1934, the plants in this experiment were removed, and the area was thoroughly ploughed and laid down under a mixed crop of *Centrosema pubescens* and *Calopogonium mucunoides*, the intention being to let this green manure crop remain on the area for about 9 months and then to turn it in, preparatory to laying down a new experiment. Growth of the green manure crop has, however, been extremely poor and an experiment to test the response of the crop to fertilizers has since been laid down.

The area of the cultural treatment trial is one which gave evidence during the course of the experiment of the presence of a form of "wilt" in the pineapple plants, and investigations regarding this were carried out, and are referred to elsewhere in this report.

Experiment No. (4). Green Manurial Experiment.

This experiment, in which pineapples were planted by the double row (5 ft x 2 ft. x 2 ft.) method after green manures, consisted of twenty-four 1 sq. chain plots. On twelve of these plots six different green manure crops were grown, there being two plots of each crop. The green manures on these plots were sown in April, 1932, and in July, 1932, they were turned in and pineapples planted. On the remaining 12 plots, the same six green manures were represented, but the crops were repeated, *i.e.* after turning in the first series of green manure dressings in July, 1932, a second and similar series of crops was laid down. In April, 1933 (six months after sowing) these were turned in and pineapples were planted in May, 1933. This experiment, therefore, consists of pineapples planted after one crop of green dressing on one half, and after two crops on the second half. The whole area received a complete fertilizer dressing consisting of $\frac{1}{2}$ cwt. sulphate of ammonia, 3 cwts. basic slag and $\frac{1}{2}$ cwt. sulphate of potash per acre in April, 1932, before the green manures were sown.

A statistical analysis of the results was carried out, and indicated that the yield of no one green manurial treatment was significantly greater than that of any other (Table 4). As there were only two replicates of each treatment, the experiment does not lend itself to good statistical analysis and, although there were considerable differences in yield between the treatments, these differences were not significant. A more striking result, however, was obtained by comparing the results of the double green dressing with those of the single dressing (Table 5). In every case it was found that the single dressing had produced much the better effect. Some explanation of this unexpected effect is needed, and it seems probable that it may be traced to the fact that the fertilizer applied in April, 1932 still remained in sufficient quantities in the soil to effect an increase in yield in the earlier crop of pineapples. The pineapples following two crops of green manure were planted some 7 months later, by which time it is probable that the residual effect of the fertilizer was considerably reduced. It is also possible that the double dressing of green manure produced the effect, known to occur in other instances, of causing a temporary locking up of nitrogen in the soil, with consequent depressing effect on the yields of the pineapple crop.

In this experiment the actual green dressings turned in were the following:—

I. *Mimosa invisa.*
II. Natural grass (free from lalang).
III. *Tephrosia candida.*
IV. Groundnuts.
V. Natural grass (unweeded).
VI. *Crotalaria anagyroides.*

Table IV.

Mean Yield per Plot (1/10th acre) from Time of Planting, September, 1932 to July, 1935.

(Irrespective of single or double dressings of green manurial treatment).

	Mimosa invisa	Natural grass. (free from lalang)	*Tephrosia candida.*	Ground-nuts.	Natural grass. (un-weeded)	*Crotalaria anagyroides*
Mean No. of ... fruit per plot	300	291	273	259	318	326

General mean = 291.

Owing to the very large random error of 316, none of the differences are significant.

Table V.

Mean Yields showing Comparison between Single and Double Dressing for each Green Manurial Treatment.

(The figures in the first line of the table have been reduced by 1/7th to make a true comparison between single and double dressings owing to the greater period of the former).

	Mimosa invisa	Natural grass. (free from lalang)	*Tephrosia candida.*	Ground-nuts.	Natural grass. (un-weeded)	*Crotalaria anagyroides*
Mean No. per plot (Single ... dressing) ...	330	310	325	333	412	371
Mean No. per plot (Double ... dressing) ...	211	221	168	129	155	225
Mean Weights (Single ... dressing) ...	2.563	2.654	2.290	2.454	2.587	2.420
Mean Weights (Double ... dressing) ...	2.682	2.598	2.649	2.730	2.525	2.741
Mean yield in tons per acre per annum. ... (Single ... dressing) ...	1.515	1.462	1.330	1.458	2.006	1.761
Mean yield in tons per acre per annum. ... (Double ... dressing) ...	1.023	1.036	0.796	0.630	0.697	1.819

The experiment is being continued, and the yield results should prove of greater value when available for a longer period than has been possible hitherto. It is worthy of note that the average weight of fruit in this area (over the whole 24 plots) is lower than that yielded by pineapples planted by the single row method in the Manurial Experiment for the corresponding period, and also lower than the average weight of fruit given by the same planting distance in the Planting

Distance Experiment. On the other hand, the *numbers* of fruit yielded from the Green Manurial Experiment compare favourably with those from the other two experiments, so that again a definite limiting factor in close planting, as regards the weight of fruit, is clearly indicated.

Experiment No. (5). *Variety Trials.*

A number of varieties of pineapple were planted in single rows for observation purposes in June, 1931, and records of the type of fruit and general characteristics of the plant have been recorded periodically since that time. Owing to the lack of canning research facilities, it has not been possible up to the time of this report to submit the fruits to canning tests but these difficulties will shortly be overcome. The varieties planted were the following:—

(i) Trichur
(ii) Hitam or Merah
(iii) Ruby
(iv) Bogor or Mauritius
(v) Montserat
(vi) Comte de Paris
(vii) Kew or Sarawak
(viii) Smooth Cayenne.

Of these varieties, only two—*viz.* the Ruby and the Sarawak—may be regarded as of potential commercial importance from the canning point of view in Malaya, since all the remaining varieties have extremely spiny leaves, which is a serious drawback to large scale planting as labourers dislike working amongst such plants. The variety Hitam or Merah is similar to the Singapore Canning pine in type, but has spiny leaves, and since spininess of the leaf appears to be a very variable character, it seems very probable that this variety was the original form of the present pineapple, artificial selection having been automatically carried out by Chinese labourers in the field, over a period of years, resulting in the present smooth leaved plant now used throughout Malaya for canning purposes.

Ruby is very probably the same as the Singapore (or Malayan) Canning pineapple, but has acquired a local name. Its vegetative and fruit characteristics closely resemble those of the ordinary canning pineapple and, apart from certain rather indefinite differences in fruit flavour and texture, is indistinguishable from it.

The Sarawak or Kew pine has provided an interesting study, since it has been grown alongside and compared with, the Smooth Cayenne variety, which is used in Hawaii for canning purposes. Examination of the vegetative and fruit characteristics over a considerable period has led to the conclusion that these two varieties are the same, although they probably were originally imported from different sources. The Sarawak pine as grown in Malaya is a larger fruit than the Smooth Cayenne grown in Hawaii, but in all other respects is similar. It therefore seems probable that the Smooth Cayenne, if grown for several generations

in Malaya, would be exactly similar to the Sarawak. Environment plays a considerable part in influencing the type of fruit produced in pineapples, and the Malayan climate being humid and to a large extent non-seasonal, causes the Sarawak and the Smooth Cayenne fruit to become large, very juicy, rather coarse in texture, and pale in colour of the flesh. It has not yet been possible to subject either of these varieties to proper canning tests so that it is, as yet, impossible to say whether either offers commercial possibilities. In view of the fact that the market for Malayan pineapples has largely been built up on a "golden" colour, it is probable that the pale flesh of the Sarawak or Smooth Cayenne would not appeal to buyers to the same extent, and the matter is still subject to trial. Sarawak pineapple suckers are, however, being planted up in Formosa, where a large scale pineapple industry is being developed at the present time and the potentialities of this variety are deserving of further attention.

Experiment No. (6). Close Distance Planting Experiment.

The knowledge that quite different methods of planting pineapples as a sole crop are used successfully in other pineapple producing countries, led to an experiment being laid down at the Pineapple Station to investigate the possibilities of very close planting, combined with manuring, and in November, 1932, an area prepared for this purpose was planted. The lay-out consisted of two blocks each of ten 1 sq. chain plots, one block being manured and the other unmanured. The fertilizer dressing consisted of sulphate of ammonia 100 lbs., superphosphate 300 lbs., and sulphate of potash 100 lbs., and was applied at the rate of 500 lbs. per acre. The pineapples were planted in bands of four rows 2 ft. apart with 2 ft. between plants in the row (diagonal planting), each band of four rows being spaced 5 ft. from the next.

The area was previously planted in green manures, but no attempt has been made to compare the individual effects of these, since an equal number of replicates of each was not represented in the area. The experiment is a simple comparison of the yield from a manured and an unmanured block of pineapples, both blocks being very closely planted.

The general growth and vigour of the plants in this experiment have been continuously good up to the time of this report, and one of the most noticeable features has been the prevention of soil erosion, which on large pineapple estates is a problem of some urgency, particularly in the State of Johore.

An examination of the yield figures for the period May, 1934 to July, 1935, indicates that the number of fruit and the weight of fruit are considerably in excess of those obtained over similar periods in the Manurial Experiment and are, in fact, comparable to those obtainable on newly cleared jungle areas planted by the single row method. In the period August, 1934 to July, 1935, the mean yield of fruit from the unmanured plots in tons per acre per annum was 4.692 tons. The manured plots gave a mean yield of 5.146 tons per acre. Under average conditions a yield of say 5 to 6 tons per acre per annum is considered usual on Malayan pineapple estates, and the yields from this close planted area compare with this figure.

Table VI

Close Planting Demonstration Block.

	Treatment.	1st Period. May — July, 1934.		2nd Period. Aug. 1934 — July, 1935	
		No.	Weight.	No.	Weight.
Means per plot 1/10th acre	Unmanured	130	3.000	379	2.773
	Manured	147	2.918	402	2.864
Yield in tons per acre per annum	Unmanured	6.964 (calculated)		4.692 (actual)	
	Manured	7.656 (calculated)		5.146 (actual)	

The application of manure has not so far effected any considerable increase in fruiting capacity, but results from other experiments have clearly shown the necessity of recording results for several seasons, in order to obtain an accurate idea of the effect of treatments, and this experiment will therefore be continued.

It was noticed during the last fruiting season of 1935 in this experiment, that the close planting has caused the fruit stalks to become thinner and therefore weaker with the result that, in some cases, the stalk broke or fell over when the fruit became heavy. It is possible, therefore, that the distance between the rows, or between plants in the rows, is too small for the best all-round results and an experiment to test this would be of value. Such an experiment is under consideration at the present time.

Experiment No. (7). Selection Trials.

The improvement of the local pineapple used for canning purposes is an important feature of the pineapple industry, since the small size, deep eyes, number of seeds, etc., which are common in the local fruit, are serious disadvantages from the canning point of view. Selection work has therefore been started at the Pineapple Station, and a scheme for the improvement of the local pineapple was put into operation in February, 1934. Examination of a large number of fruits, with a view to ascertaining the depth of the eyes, occurrence of seeds and abortive ovaries, etc., was first of all carried out and it was found that the depth of the eyes and number of seeds, etc., varied considerably in fruits of the same size. Examination of plants in the field showed that certain definitely undesirable types were common. The artificial selection scheme is therefore designed to eliminate the bad types, and to produce as many plants as possible, all of which exhibit shallowness of eye, good colour, absence of seeds, etc., and which are vigorous,

healthy, and productive of a large well-shaped fruit. It is hoped to raise a stock of selected plants which can then be multiplied and supplied to estate owners. The fact that pineapples are normally propagated vegetatively assists considerably in this object.

The way in which the selection is performed is as follows. Plants bearing fruit in the field are examined and those exhibiting all the following desirable external characteristics are marked: leaves free from spines, free from pests and diseases, fruit large, cylindrical and of even shape and medium length, crown sucker small, single, and non-spiny, and "slips" (*i.e.* suckers from immediately below the fruit) well developed. The fruit from the selected plant along with its "slips", or suckers, are removed from the plant, and the fruit then subjected to a more detailed examination. The suckers are removed, the crown and stalk cut off and the fruit weighed. An instrument designed to remove a cylinder of fruit 3.4 ins. in diameter is then pushed through the fruit longitudinally. The size of the instrument used for this purpose was fixed after a number of tests had been made. Three inches is the approximate diameter of a 1½ lb. "tall" tin.

The cylinder of fruit extracted is examined for eyes, seeds, (abortive or otherwise), diseases, bruises, etc., and if it is found to be free from all defects, the suckers of the fruit under examination are then labelled and set aside for planting at the Pineapple Experiment Station. These suckers are planted out in rows 5 ft. apart with 2½ ft. between plants in well manured soil, and are allowed to grow and produce fruit. The fruits from these suckers are then examined by the above method and, if the characteristics of the parent have been reproducd, the plant is multiplied up for distribution purposes.

So far, approximately 130 selections, represented by some five or six suckers each, have been planted at the Pineapple Station, some of which will shortly be producing the first fruits. The selections were made from pineapple estates in Johore, Singapore and from the Pineapple Station itself, and have made good progress.

Experiment No. (8). Revised Manurial Experiment on Pines Closely Planted.

The results of the main manurial experiment have naturally given rise to a number of points which materially affect the problem of sole crop planting of pineapples. These results have shown that some desirable effects have resulted from the use of certain fertilizer mixtures. They do not show, however, how far these effects could be improved by increased amounts of fertilizer or, in other words, what is the upper economic limit of fertilizing, nor do they indicate the possibilities of combining increased fertilizing with closer planting. With the object of obtaining information on these obviously important points, therefore, an experiment was laid down in May, 1935, and consists of a 4 x 4 Latin Square, with plots of 1/20th acre each. Four fertilizer treatments are represented, and the plants were spaced in triple rows 2 ft. apart (diagonal planting), with 5 ft. between each band. In laying down this experiment it was thought that the best

results would probably be obtained by applying the fertilizer at short intervals, and the mixtures have therefore been applied every three months. It was also considered desirable to apply both acid and alkaline mixtures, and all "odd" (*i.e.* 1st, 3rd, etc.,) applications are therefore alkaline and all "even" applications (*i.e.* 2nd, 4th, etc.) are acid. The treatments are as follows:—

For first and all succeeding odd applications	For second and all succeeding even applications
Per acre per quarter.	Per acre per quarter.
Treatment A.	Treatment A.
50 lbs. Calcium cyanamide.	50 lbs. Sulphate of ammonia.
150 lbs. Basic slag.	150 lbs. Superphosphate.
50 lbs. Sulphate of potash.	50 lbs. Sulphate of potash.
Treatment B.	Treatment B.
100 lbs. Calcium cyanamide.	100 lbs. Sulphate of ammonia.
300 lbs. Basic slag.	300 lbs. Superphosphate.
100 lbs. Sulphate of potash.	100 lbs. Sulphate of potash.
Treatment C.	Treatment C.
150 lbs. Calcium cyanamide.	150 lbs. Sulphate of ammonia.
450 lbs. Basic slag.	300 lbs. Superphosphate.
150 lbs. Sulphate of potash.	150 lbs. Sulphate of potash.
Treatment D.	Treatment D.
200 lbs. Calcium cyanamide.	200 lbs. Sulphate of ammonia.
600 lbs. Basic slag.	600 lbs. Superphosphate.
200 lbs. Sulphate of potash.	200 lbs. Sulphate of potash.

The experiment was laid down on part of the area previously allotted to the Planting Distance Experiment, and, before planting, this area was thoroughly ploughed and harrowed so that a good tilth resulted. Pineapples were planted on May 18th, 1935, and the first dressing of fertilizer was applied on May 30th, 1935. A second dressing was applied in August, 1935. All plants have made very good progress to date. Differences between treatments are not yet, however, discernible. Fruit from this area was expected in December, 1936, and the yields should give interesting results.

Experiment No. (9). Cross Fertilization Trials.

Cross fertilizing of pineapples with a view to breeding a type of pineapple more suitable for canning than the one at present planted throughout Malaya, has so far been confined to the hybridization of the Sarawak and the Singapore Canning pine, but this has produced very interesting and possibly very important results.

In April, 1933, the flowers of two developing Sarawak pineapple plants were emasculated, and ripe pollen from a flowering Singapore Canning pine was applied to each flower emasculated. The two fruits were then allowed to develop and were harvested in June, 1933. From the two fruits a total of 14 seeds was extracted, and these were sown in boxes. Of these 14 seeds, only four germinated, and two of the seedlings subsequently died. The two surviving seedlings were

kept in boxes until about 5 ins. high, and were then transplanted to a nursery bed manured with a complete dressing of artificials, and mulched with Pabco paper mulch. From the outset the seedlings showed very different characteristics. One was smooth leaved and of a dark green colour, while the leaves of the other were extremely spiny and of a pronounced reddish colour. These differences became more marked as growth proceeded, and a further difference became apparent. The smooth leaved, dark green plant grew much more quickly, and produced a number of subterranean suckers, and, later, a large number of slips and a large fruit, while the other has grown very slowly, has produced no suckers and has shown no signs of fruiting.

The developing fruit of the smooth leaved plant exhibited characteristics very similar to the Sarawak variety, but its rate of suckering was much higher than is normally the case in plants of that variety.

The fruit was harvested on October 3rd, 1935, *i.e.* 28 months after the seed was sown. Since pineapples grown from seed often take over three years to mature, this plant is obviously a quick grower. The following description of the fruit is of considerable interest since its characteristics render it apparently very suitable for the local canning trade.

(i) Large (7 lbs. 2 ozs.) cylindrical, tapering towards the tip.
(ii) Green skinned, changing when ripe to yellow.
(iii) Core—1 in. in diameter. Strongly marked.
(iv) Seeds—present, but not deep seated.
(v) A cylinder of fruit 3.5 ins. in diameter was extracted from the complete fruit, having no eyes, seeds or black spots.
(vi) Flesh—*golden yellow in colour* and firm.
(vii) Flavour sweet, very juicy.
(viii) Texture somewhat fibrous, but not more so than the present Singapore Canning pineapple.

It will be seen from the above description that this plant appears to be a definite hybrid, and exhibits many very desirable features. The suckers obtained from it have been planted out, and further tests—including canning—will be carried out on it in due course.

Experiment No. (10). Stem Slice Method of Propagation.

A number of trials of a new method of propagating pineapples, evolved originally by the Agricultural Officer, St. Lucia, B.W.I. have been carried out at the Pineapple Experiment Station since May, 1934. The method consists of planting cross-sections of the young developing stem of the pineapple plant, after dipping the slices in a weak solution of potassium permanganate. The details of the method are as follows:—

The young stem of a vigorous plant, prior to the formation of flowering buds, is stripped of its leaves and is sliced into transverse sections, care being exercised to ensure that two or three dormant buds are represented in each section. The

slices are then dipped in a weak solution of potassium permanganate for about 5 minutes, allowed to drain, and are then planted in prepared well-drained soil in boxes.

Varying degrees of success have been attained with the method, and success appears to depend to a great extent on the vigour of the original plant, and the amount of watering carried out. Excess water has been found to promote rapid decomposition of the slices with consequent poor germination.

At the Pineapple Station, better results have been obtained with Smooth Cayenne plants than with the Singapore Canning variety. The best results with the latter variety were obtained in a trial carried out in July, 1934, when 8 suckers were obtained from 18 slices. On the other hand, trials with the Smooth Cayenne variety carried out in 1935 have yielded up to 60 per cent. germination.

A quantity of material for botanical work has been raised by the stem slice method, and this method of propagation is useful for obtaining a large number of plants from one original plant. It seems doubtful, however, on the results achieved to-date, if the method is of commerical importance.

Experiment No. (11). Ferrous Sulphate Spraying Trials.

An experiment to test the response, if any, of pineapples to a solution of ferrous sulphate sprayed on to the leaves, was laid down in June, 1934. The practice of spraying with ferrous sulphate has been found to produce beneficial results in Hawaii, where the operation is regularly performed.

The experiment at the Pineapple Station consisted of two rows, each of 50 plants of the Singapore Canning, Sarawak and Mauritius pineapple varieties, one row of each variety being sprayed with a 5 per cent. solution of ferrous sulphate, the other being untreated and left as a control.

The solution was applied on June 13th, 1934, and thereafter monthly until December 1st, 1934. Observation of the sprayed plants showed that the solution had caused some scorching of the leaves, but no other difference was discernible. It was therefore concluded that this form of treatment is unnecessary for pineapples grown on soil of the type represented at the Pineapple Station, and the experiment was discontinued at the beginning of 1935.

Experiment No. (12). Effect of Drying Suckers Prior to Planting.

A theory that the drying of suckers prior to planting prevents the development of spines on the leaf of pineapple plants, was found to exist amongst Chinese planters. Since no direct evidence regarding this existed, it was decided to lay down a simple trial to test the theory. Twenty suckers from non-spiny plants dried for one month prior to planting were planted out in a row, in February, 1934, alongside a row of 20 plants which had not been dried at all. Observations made during the growing period showed that four plants in *each* row showed a slight tendency to spininess, the remainder being smooth leaved. No difference

in the degree of spininess between plants from dried and undried suckers, has at any time been observed, and it has therefore been concluded that the practice has no effect on this leaf character in the way supposed.

Experiment No. (13). Investigations of the Fruit Characteristics of the Singapore Canning Pineapple.

Observations made in the field and in the factory, over a period of some months, have seemed to indicate that there are two distinct types of Singapore Canning pineapple fruit. One type is reddish or reddish-green externally, and produces a fully golden flesh when ripe, while the other is yellowish-golden in colour on the outside when ripe, but has a distinctly pale colour flesh usually unsuitable for the "Golden" quality pack. As this is a point of considerable importance to the canner, an examination of a number of marked fruits in the field and of a number of freshly harvested fruits was made at the Pineapple Experiment Station. Some 150 fruits were examined in the field and when fully ripe were cut open, and notes made on the colour of the flesh. The figures proved rather inconclusive, for, although the two types mentioned above were found in approximately equal numbers, a fair proportion of the fruits examined exhibited characteristics of both types. From the evidence available to-date it is difficult to decide whether soil conditions are responsible for the variations in colour of the skin and/or the flesh, or whether the types are botanically distinct. There is, however, sufficient evidence to warrant further and more detailed investigations on this subject. The point is important, for if the colour of the flesh or the skin is a fixed botanical character, it will be necessary to modify the scheme for artificial selection in order to eliminate types which exhibit an undesirable colour in the flesh of the fruit.

Experiment No. (14). Miscellaneous Minor Investigations.

During the past three years, miscellaneous minor investigations on the Singapore Canning pineapple have been carried out at the Pineapple Experiment Station.

(i) The first of these experiments dealt with the question of disease. From time to time at the Station, a form of "wilt" occurred amongst the plants. The leaves became reddish or yellowish and of unhealthy appearance, the plant dwindled in size and the fruit produced became very small. On two occasions affected plants were submitted to the Entomological and Mycological Divisions of the Department of Agriculture for examination, but no specific causal pest or organism was found. A few mealy bugs were present on some of the samples, but the numbers were so small as to preclude the possibility of these insects causing the apparent "wilt".

(ii) A number (about 100) of affected plants were subsequently removed from the area on which they were growing and planted out in an area which was manured with cattle manure and artificials, and mulched with Pabco mulch paper. All these plants recovered, put on new growth, and ultimately fruited quite

normally. It seems apparent therefore that the "wilt" was not primarily caused by pest or disease attacks, but was due to some adverse soil or nutrition condition.

(iii) At the same time as the above investigations were proceeding, another attempt to diagnose the direct cause of "wilt" was made. Certain areas in the Planting Distance, Cultural Treatment and Green Manurial Experiments, from time to time developed a badly yellowed or wilted appearance. The presence of a soil pan beneath the surface was therefore suspected, and a detailed investigation of the whereabouts of this pan was therefore made. A soil auger was inserted to a depth of 2 feet at points 10 feet apart, (throughout all the areas containing affected plants), and it was found that a definite lateritic gravel pan was present in several places. A detailed plan of this pan was prepared, and this was followed by a plan of all the affected areas. On comparing the two plans, however, it was found that no correlation existed, and it was therefore concluded that the previously suspected cause of the wilting was not primarily the presence of this pan.

The results obtained by transferring affected plants to a well manured area and also, subsequently, by manuring badly wilted plants seemed to indicate that the so-called "wilt" was caused by a lack of proper plant nutrients in the soil but further experiments regarding this are contemplated.

(iv) The presence of a species of small black ant on pineapple plants at flowering time was observed to be frequent, and in May and June, 1934, observations on the frequency of these occurrences were made. Fifty plants of the Singapore Canning pineapple in the pre-flowering stage were selected, and an examination of each was made each morning to ascertain if ants were present. In every case it was found that ants appeared one or two days before the first flowers opened, and disappeared three days after the flowering was complete. During this period, the insects were observed to be very active and crawled inside the flowers and from one flower to another. Since the number of seeds in the fruits of the Singapore Canning pineapple has been found to vary considerably, it seems probable that ants are to some extent responsible for the pollination of the flowers, hence the number of seeds formed.

Investigations did not proceed further than those described above, but the observations made point to the necessity of more detailed examination of the possible effects of insect pollination.

II. Summary.

This report outlines the progress of the experimental work which has been carried out at the Pineapple Experiment Station to-date. Certain important results have been obtained, notably with regard to the questions of manuring and planting distances for pineapples planted as a sole crop. As a result of the experiments carried out, certain manurial treatments and certain methods of planting can be recommended as improvements on previous local practice. In addition to this knowledge, some information regarding cultural practices, varieties, and green manuring is also now available, while progress towards the improvement of the

canning pineapple by artificial selection and the production of an improved type by cross-breeding have been very satisfactory. Investigations of a number of minor problems associated with pineapple growing have also been carried out, and have elucidated a number of points of importance to cultivators.

III. Conclusions and Recommendations.

The work carried out at the Pineapple Station for the past five years is likely to prove of importance to the Malayan pineapple industry, since the problems investigated have all been associated with the cultivation of pineapples as a sole crop, and the results achieved to-date are indicative of a number of practices which it will be necessary to introduce if the crop is to be planted on an extensive scale, and if the fertility of the land is to be maintained. The planting of selected types of pineapple in double or triple rows along the contour seems, on the evidence available, to be desirable on sloping land. The maintenance of fertility and productivity of the soil must be ensured by some form of manuring, or by rotation with green dressings. The most satisfactory means of carrying out these necessary measures have not yet been finally worked out, but sufficient information is available to enable recommendations to be made.

It is very desirable that the experimental work which has been carried on in the past should be maintained, since there are a number of points regarding which information is still scanty. The points of greatest importance in this connxion are those connected with the solution of the soil erosion problem, the number of seasons for which pines may be profitably grown before replanting, the influence of soil on the quality and appearance of the fruit and the production of improved types of pineapple suitable for the expansion of the Malayan pineapple trade. Work on all these points has already been initiated, and should prove of considerable value in due course. The programme of experimentation from the time of development of the Pineapple Station to the present date has done much to shed light on several of the major problems connected with the cultural aspects of the crop, and its continuance should make further valuable contributions to the needs of an important industry.

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RICE IN MALAYA IN 1936

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Prices.

The price of rice fluctuated within narrow limits during 1936, the average wholesale price being $3.63 which was 3 per cent. less than that recorded for 1935. The retail prices in Singapore and Penang showed a tendency to depreciate, but remained steady in Malacca throughout the year.

Favourable weather conditions and absence of insect pests in some other rice producing countries had a satisfactory effect on yields which, in some cases were above normal.

There was no change in freight charges to Malaya and no major changes in local railway rates for transport of rice.

Details of wholesale and retail prices are given in Table I.

Table I.

Average Price of Rice and Padi in Malaya in 1936.

Month	Wholesale Prices of Rice Dollars per Picul (133 lbs.)			Retail Prices of Rice Cents per Gantang (Gallon)			Price of Padi per Picul at Government Rice Mill, Bagan Serai.
	Siam No. 2 (ordinary)	Rangoon No 1	Saigon No. 1 (Long Grain)	Singapore	Penang	Malacca	
January ...	3.64	3.45	3.37	34	30	26	1.65
February ...	3.81	3.35	3.35	32	28	26	1.70
March ...	3.85	3.30	3.60	30	28	26	2.20
April ...	3.95	3.45	3.67	28	28	25	2.10
May ...	3.96	3.55	3.65	28	28	26	2.00
June ...	3.75	3.50	3.50	28	30	26	1.90
July ...	3.62	3.45	3.50	28	30	26	1.90
August ...	3.85	3.47	3.57	26	30	26	1.90
September ...	3.75	3.47	3.77	25	28	26	1.90
October ...	3.71	3.30	3.40	24	29	26	1.90
November ...	4.06	3.47	3.72	26	30	26	1.90
December ...	4.35	3.47	3.92	28	31	30	1.90
Average for 1936 ...	3.86	3.44	3.59	28	29	26	1.91
Average for 1935 ...	3.98	3.60	3.64	30	24	27	1.94

Imports and Exports.

A statement of the total annual imports and exports of rice with values for the past eight years is given in Table II. The net imports of rice in 1936 were 533,795 tons which is approximately 12 per cent. greater than in 1935. The value of these imports was $32,207,427, an increase of 10.8 per cent. compared with 1935.

The different grades of rice imported during 1936 were as follows (net imports only are given):—cargo rice 23,526 tons, parboiled 50,267 tons, white rice 374,890 tons, broken 85,112 tons.

The total quantity of rice products imported for local consumption in 1936, including bran, rice flour and rice meal, of which 147,465 tons valued at $4,064,411 were imported, amounts to 863,097 tons valued at $47,118,216, as compared with 609,677 tons valued at $32,688,203 for 1935. The net imports of padi, which amounted to 4,526 tons valued at $155,183 in 1936, are not included in those figures.

The rice supplies (gross imports) were obtained from the following sources—Siam 479,355 tons (67.0 per cent.), Burma 199,954 tons (27.9 per cent.), French Indo-China 28,365 tons (4.0 per cent.), other countries 7,958 tons (1.1 per cent.).

Table II.

Rice: Malayan Imports and Exports.

Year	Imports		Exports		Net Imports	
	Tons	Value $	Tons	Value $	Tons	Value $
1929	785,558	95,461,036	233,897	28,031,407	551,661	67,429,629
1930	800,443	87,666,723	208,688	23,361,561	591,755	64,305,162
1931	691,112	48,458,102	175,385	13,453,189	515,727	35,004,913
1932	592,209	39,632,925	183,209	12,660,493	409,000	26,972,432
1933	592,912	33,846,158	159,746	9,493,291	433,166	24,352,867
1934	619,199	32,813,558	165,968	8,609,566	453,231	24,203,992
1935	660,020	40,304,120	185,065	11,083,157	474,955	29,053,801
1936	715,632	43,053,805	181,837	10,846,378	533,795	32,207,427

Area Planted.

The area of land planted with wet padi was, in the aggregate 9 per cent. less than during the previous season, although, in certain States an increase is shown. "Dry" padi cultivation again showed a decline, the area for 1935-1936 being 50,150 acres in comparison with 65,440 acres for the 1934-1935 season. A record

crop was obtained in Kedah where the total yields of wet and dry padi were 96,360,000 gantangs, owing partly to the increase in the area planted. On the whole, the total yield for Malaya, in comparison with the previous season, shows an increase of 7,318,000 gantangs, for which the Unfederated Malay States are principally responsible.

A summary of the areas and production of padi for the past seven seasons is given in Table III.

Table III.

Areas and Yields of Padi.

Year	"Wet" Padi			"Dry" Padi			Total	
	Area Acres	Yield Gantangs	Gantangs Per Acre	Area Acres	Yield Gantangs	Gantangs Per Acre	Area Acres	Gantangs Yield
1929-30	629,650	103,624,000	164	27,550	3,160,000	114	657,200	106,784,000
1930-31	603,070	166,845,000	277	104,670	9,122,000	87	707,740	175,967,000
1931-32	635,130	184,631,000	291	89,850	12,472,000	139	724,980	197,103,000
1932-33	674,920	186,345,000	276	91,990	13,416,000	146	766,910	199,761,000
1933-34	691,110	215,098,000	311	74,140	9,389,000	127	765,250	224,487,000
1934-35	669,290	213,835,000	319	65,440	6,720,000	106	734,730	220,555,000
1935-36	674,900	219,786,000	325	50,150	8,087,000	161	725,050	227,873,000

(Acreage to nearest 10 acres: yields to nearest 1,000 gantangs)

Table IV.

Area of Land Planted in Malaya and Yield of Rice.

Season	F.M.S.		S.S.		U.M.S.		Total	
	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons
1929-30	174,466	47,153	67,005	24,830	415,727	74,985	657,198	152,549
1930-31	178,930	54,257	67,350	37,584	461,460	159,540	707,740	251,381
1931-32	194,580	64,371	67,980	37,701	462,420	179,503	724,980	281,575
1932-33	214,160	72,624	70,530	34,300	482,220	178,449	766,910	285,373
1933-34	195,690	75,006	70,550	42,034	499,010	203,656	765,250	320,696
1934-35	176,750	75,694	68,500	41,851	489,480	197,533	734,730	315,078
1935-36	178,020	74,221	67,750	35,982	479,280	215,330	725,050	325,533

(Yield estimated on a basis of 700 gantangs of padi = 1 ton of rice).

Table V.

Area of Land planted in Malaya and Yields of Padi Season 1935-1936.

Territory or State	Wet		Dry		Total	
	Acres	Gantangs	Acres	Gantangs	Acres	Gantangs
F.M.S.						
Perak ...	90,670	29,215,000	2,290	291,000	92,960	29,506,000
Selangor ...	18,380	4,503,000	460	70,000	18,840	4,573,000
N. Sembilan ...	33,850	10,414,000	40	4,000	33,890	10,418,000
Pahang ...	31,350	7,275,000	980	183,000	32,330	7,458,000
Total ...	174,250	51,407,000	3,770	548,000	178,020	51,955,000
S.S.						
P. Wellesley ...	31,240	10,409,000	450	193,000	31,690	10,602,000
Malacca ...	32,050	12,778,000	—	—	32,050	12,778,000
Penang ...	4,010	1,807,000	—	—	4,010	1,807,000
Total ...	67,300	24,994,000	450	193,000	67,750	25,187,000
U.M.S.						
Johore ...	9,420	1,029,000	1,140	103,000	10,560	1,132,000
Kedah ...	244,490	96,037,000	1,930	323,000	246,420	96,360,000
Perlis ...	41,820	12,130,000	—	—	41,820	12,130,000
Kelantan ...	106,030	27,314,000	32,990	5,082,000	139,020	32,396,000
Trengganu ...	31,590	6,875,000	9,870	1,838,000	41,460	8,713,000
Total ...	433,350	143,385,000	45,930	7,346,000	479,280	150,731,000
Total Malaya ...	674,900	219,786,000	50,150	8,087,000	725,050	227,873,000

Note:—Acreage to the nearest 10 acres.

Yield to the nearest 1000 gantangs.

Production of Padi.

The yields per acre both of "wet" and "dry" padi for this season were slightly better than for the previous season, in spite of the fact that there was a decline in the acreage planted. This may be ascribed to the improved conditions of irrigation and to the more widespread use of better strains of padi.

The total production of rice (both from the "wet" and "dry" systems of cultivation) is given in Table IV and shews an increase over the past six seasons.

Consumption Compared with Production.

It will be seen in Table VI that there is a slight drop in the percentage of production to consumption. Consumption in 1936 was approximately 70,000 tons greater than in 1935, a consequence most probably of improved conditions and the greater influx of labourers from India, circumstances which were foreseen by the writer of the review of the rice situation published in February 1936.

Table VI.

Malayan Production of Rice in Relation to Net Imports and Consumption 1930-1936.

	1930	1931	1932	1933	1934	1935	1936
Net imports (tons) ...	591,755	515,727	409,000	433,160	453,229	474,955	533,795
Production (tons) ...	152,549	251,381	281,575	285,373	320,696	315,078	325,533
Consumption (tons) ...	744,304	767,108	690,575	718,539	773,925	790,033	859,328
Percentage of production to net imports ...	26	49	69	66	71	66	61
Percentage of production to consumption	20	33	40	40	41	40	38

Acknowledgments.

The Field Branch of the Department of Agriculture, in collaboration with the Land Officers, were responsbile for the estimates of areas and yields as summarized in Table V. The figures for imports and exports, and values thereof, are obtained from the Monthly Summary of Imports and Exports, published by the Statistics Department, Straits Settlements and Federated Malay States, and are subject to minor adjustments at a later date.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

4th Quarter, 1936.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

As is usual at the close of the year weather conditions were extremely wet throughout the quarter, with occasional localized dry spells in various parts of the country.

Prices.

The spectacular improvement in the price of rubber during November and December was reflected in the prices paid for small holding rubber, and the range of the lowest and highest prices together with the means are given in Tables I and II.

Production.

Table III summarizes production on small holdings during the year. The table is compiled from the monthly reports of production, stocks, imports and exports of rubber published by the Registrar-General of Statistics, S.S. and F.M.S.

Tapping.

The quarterly survey of small holdings out of tapping was made, estimates being calculated by counting the number of holdings out of tapping, and applying the percentage to the total area of small holdings in the relative District.

Table IV summarizes the results of the survey for the quarter under review, and Table V shews, for the purpose of comparison, corresponding figures for 1935 and for the third quarter of 1936.

It will be noted that there was the further decrease in holdings out of tapping to be anticipated from the improved price of rubber. On the other hand, in some parts of the country many holdings were out of tapping during the last part of the year owing to wet weather, lack of coupons, and the incidence of padi harvest.

Condition of Holdings.

The majority of reports state that the general condition of small holdings is improving, with attention being paid to weeding and *lalang* grass eradication. More care has been given to tapping, with consequently fewer cases of damage from faulty tapping. One report, however, stated that there was little improvement in upkeep management, conditions of holdings actually being poorer, with wet weather interfering with weeding.

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

4th Quarter 1936.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			OCTOBER					
Smoked sheet	33.00-37.00	33.00-35.10	31.00-36.40	32.50-36.00	30.00-35.95	34.50-36.00	34.00-37.50	33.00-35.70
Unsmoked sheet	32.00-36.40	29.00-34.50	27.40-35.30	32.00-35.00	25.00-35.20	33.50-35.00	32.00-36.00	30.30-35.40
Scrap	22.00-31.00	—	29.00-31.00	—	26.50-30.00	28.00-33.00	28.00-33.50	22.50-31.00
			NOVEMBER					
Smoked sheet	36.35-43.00	34.00-40.50	34.00-39.75	34.00-40.00	32.70-39.65	38.50-40.50	35.00-40.50	34.00-40.00
Unsmoked sheet	36.00-42.00	30.00-39.50	32.00-38.50	33.00-38.50	30.70-39.00	37.50-39.50	34.00-39.50	32.30-39.00
Scrap	25.00-35.40	—	34.50-35.50	—	29.00-34.00	21.00-36.50	30.00-35.00	25.00-34.00
			DECEMBER					
Smoked sheet	42.00-53.00	36.00-47.00	37.00-44.00	36.50-44.00	36.50-50.00	42.50-47.50	40.00-48.00	38.30-48.00
Unsmoked sheet	40.00-52.50	34.00-45.00	35.10-43.00	32.25-42.50	34.00-49.00	40.50-45.50	37.00-46.00	35.00-47.00
Scrap	33.00-41.00	—	40.00-42.00	—	32.00-44.00	36.00-44.00	30.00-41.00	29.50-44.00

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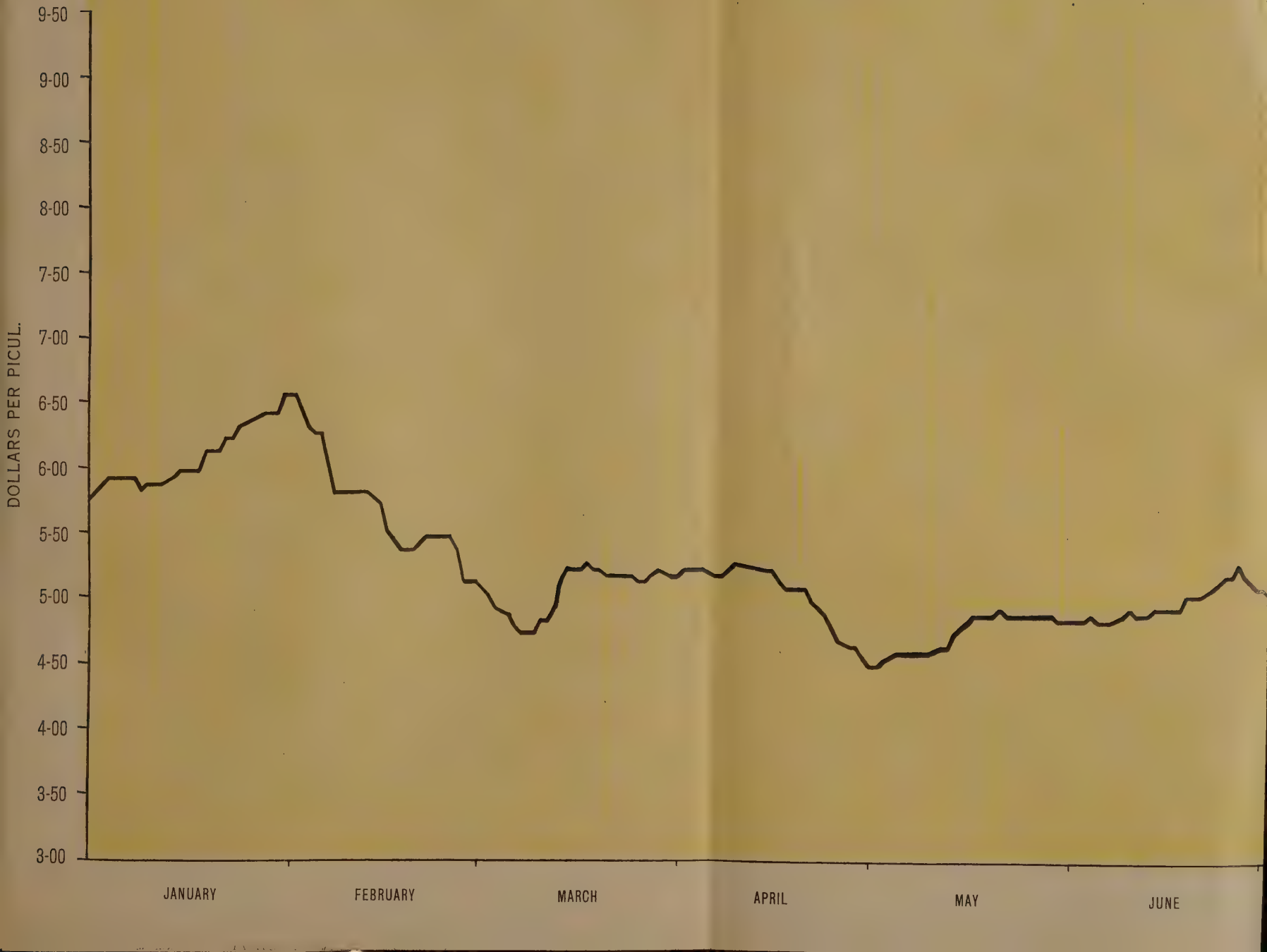

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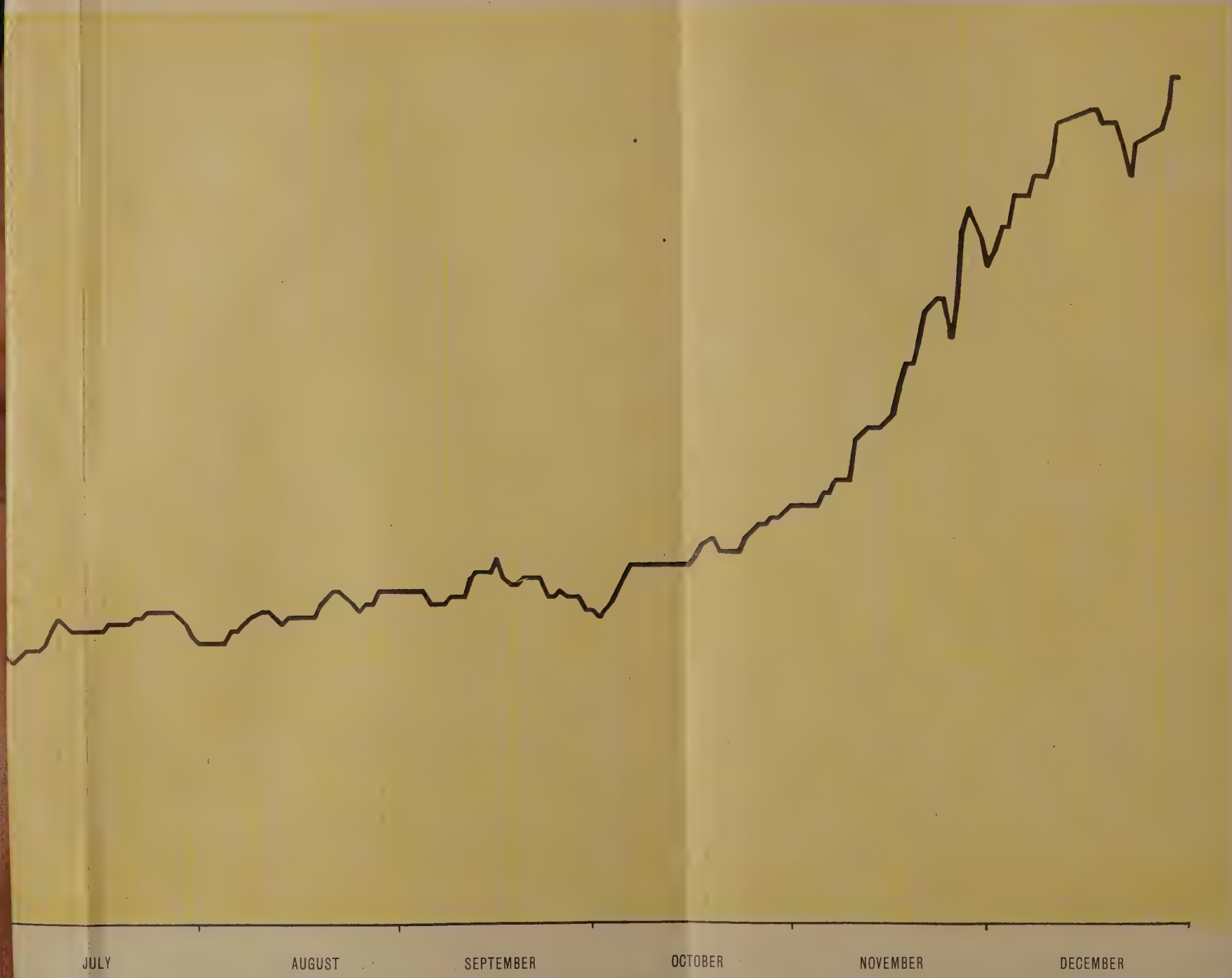

K. P. & Co., Ltd.,

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul (133 1/3 lbs.))

4th Quarter 1936.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				OCTOBER				
Smoked sheet	34.33-36.60	33.69-34.65	33.30-35.48	33.66-35.00	32.87-34.58	34.66-35.66	34.12-36.03	33.84-34.65
Unsmoked sheet	33.38-36.00	32.32-33.42	31.55-34.10	32.46-34.00	29.25-32.42	33.66-34.62	32.55-34.58	32.51-33.61
Scrap	26.25-28.75	—	29.00-31 00	—	28.60-28.77	28.66-31.00	29.00-32.00	26.51-28.83
				NOVEMBER				
Smoked sheet	37.45-42.25	36.40-38.64	36.82-39.59	36.40-39.46	35.97-38.59	38.83-40.50	37.25-39.30	36.87-38.21
Unsmoked sheet	37.00-41.25	35.01-37.19	34.12-37.35	34.00-38.10	34.45-37.12	37.66-39.17	36.58-38.60	35.20-37.39
Scrap	30.50-32.72	—	34.50-35.50	—	30.83-31.17	29.50-34.33	31.00-33.50	28.35-31.70
				DECEMBER				
Smoked sheet	42.33-50.66	40.12-42.52	41.80-44.00	38.70-43.36	40.04-44.28	43.50-44.83	41.25-45.12	41.12-43.62
Unsmoked sheet	41.75-48.88	39.21-42.09	39.75-42.70	36.25-40.75	38.95-43.55	42.00-43.00	39 62-43.25	39.01-42.45
Scrap	35.50-37.75	—	40.00-42.00	—	26.33-26.66	38.17-40.17	34.33-39.50	31.75-36.00

Table III.

Production of Rubber on Small Holdings,

(in tons)

	Total Year 1935	1st Quarter 1936	2nd Quarter 1936	3rd Quarter 1936	4th Quarter 1936	Total Year 1936
Federated Malay States ...	67,380	14,796	13,108	17,437	17,255	62,596
Unfederated Malay States ...	54,861	11,561	13,549	15,314	16,335	56,759
Straits Settlements ...	13,258	2,997	3,019	3,245	3,271	12,532
Total ...	135,499	29,354	29,676	35,996	36,861	131,887

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of December, 1936.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	33,227	6,977	21	Klang	15,410	8,782	57	Seremban	22,176	17,297	78	Raub	9,342	3,456	37
Kinta	36,090	4,691	13	Kuala Langat	23,333	6,999	30	Tampin	16,961	12,381	73	Kuala Lipis	14,588	3,063	21
Kuala Kangsar	79,572	18,301	23	Ulu Langat	39,856	15,942	40	Kuala Pilah	26,586	17,015	64	Bentong	11,574	2,546	22
Upper Perak	12,680	2,662	21	Ulu Selangor	25,857	15,255	50	Jelebu	8,917	1,605	18	Other Districts†	40,383	10,499	26
Larut & Selama	38,210	20,797	56	Kuala Lumpur†	19,327	8,503	44	Port Dickson	11,634	5,351	46				
Krian	9,270	3,800	41	Kuala Selangor†	9,512	4,185	44								
Lower Perak*	25,982	5,975	23												
Dindings	9,273	6,491	70												
	244,304	69,694	28		133,295	59,666	44		86,274	53,649	62		75,887	19,564	25

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	13,109	1,179	9	North	3,941	197	5	Singapore	20,591	205	1
Alor Gajah	30,203	8,154	27	Central	9,549	3,816	40				
Jasin	22,883	4,347	19	South	7,508	3,003	40				
				Penang	15,822	1,265	8				
	66,195	13,680	20		36,820	8,281	24		20,591	205	1

JOHORE	322,225	74,111	23
KEDAH	100,691	35,245	35

The percentage of areas out of tapping in September, 1936, was as follows:—Perak 30, Selangor 46, Negri Sembilan 67, Pahang 28, Malacca 22, Penang and Province Wellesley 31, Singapore 3, Johore 24, Kedah 39.

*Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

Table V.

Comparison of Areas of Rubber Small Holdings Out of Tapping.

	December, 1935		September, 1936		December, 1936	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S.	203,900	38.0	213,795	39.6	202,573	37.5
S.S.	33,100	28.4	26,422	21.3	22,166	18.0
Johore	not available		77,334	24	74,111	23
Kedah	not available		39,269	39	35,245	35
Malaya*	—	—	356,820	32.8	334,095	30.8

*Ignoring Perlis, Kelantan and Trengganu, in which States the area of rubber small holdings is relatively small.

Diseases.

The wet weather was responsible for the spread of Mouldy Rot, but adequate control was maintained and the sales of approved fungicides were satisfactory.

There were minor and sporadic cases of Pink Disease and root diseases, and efforts have been made to isolate trees shewing symptoms of root disease. Excessive soil wash was reported from certain Districts of Negri Sembilan where no control measures are undertaken. The same report mentions that Indian and Chinese owners of holdings have taken steps towards the establishment of silt pits and terraces.

General.

From Pahang a small amount of replanting and supplying was reported, and from Johore the budgrafting of an area of 200 acres.

During the quarter under review the coupon allowance to small holdings was increased, and reports indicate that the general economic conditions of small-holders are improving.

A number of new smoke-houses were erected during the quarter under review, but in some Districts the small difference between smoked and unsmoked sheet prices rendered the use of smoke-houses uneconomic.

Abstract.

THE EXPORT CROPS OF THE NETHERLANDS INDIES IN 1935.

Bulletin No. 137 of the Central Bureau of Statistics of the Netherlands Indies.

The total value of all agricultural products exported from the Netherlands Indies in 1935 was Gs. 301 million compared with Gs. 326 million in 1934. The total quantity exported was 3,275,000 metric tons as compared with 3,134,000 tons* in 1934, and the average value per ton was respectively Gs. 92 and Gs. 104.

Of the total value of the 1935 exports of agricultural products 64.8 per cent. was estate produce, and 35.2 per cent. native produce. Since 1925 this proportion has remained fairly stable with only small fluctuations.

In proportion to total world exports of important agricultural products, the 1935 exports from the Netherlands Indies were:—cinchona 92, pepper 82, kapok 78, rubber 33, copra 28, agave-fibre (sisal) 26, tea 17, oil palm products 16.

Cane Sugar.

The area planted with pedigree cane to serve as planting material was 4,568 hectares,† but the crop from 1,820 hectares of this area had to be milled.

The production of cane sugar was 509,659 tons and exports were 1,029,414 tons. Production has fallen to 17.5 per cent. of the average of the peak years 1928-30. Old stocks are still being exported. No figures are given of the amount of the latter still to be liquidated before production can return to normal. In 1935 it was only 3.1 per cent. of the world's total cane sugar production, whereas normally it is between 15 and 18 per cent.

Native cultivation—for home consumption—was not affected, the planted area of 11,057 hectares being very near the average of 11,145 hectares for the years 1931-1935.

Rubber.

The estate planted area was 595,309 hectares of which 518,819 hectares are in bearing. A total of 8,056 hectares of old rubber was cut down, of which 5,232 hectares were replanted with superior material. Of the total planted area 147,850 hectares (25 per cent.) are budded rubber, fully three quarters of which were planted before 1931. The area of native holdings was still unknown in 1935 but the figure will probably be available for the 1936 report. Estate production was 154,881 tons and total exports—including native rubber, estimated on dry weight—were 292,070 tons, as compared with respectively 192,830 and 385,492 tons in 1934.

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* Throughout this abstract, "ton" refers to the metric ton of 2,200 lbs.

† 1 hectare = 2,472 acres.

Of the estate area planted with rubber 230,162 hectares are in Java, 346,900 hectares in Sumatra and Rhio, and 18,247 hectares in other islands.

The export of native rubber was 144,892 tons as against 185,887 tons in 1934. The dry weight percentage of the native rubber exported has continued to improve greatly. The remilling factories reported a production of 35,717 tons in 1935 as against 23,327 tons in 1934 and 10,105 tons in 1933.

Under the International Rubber Restriction Regulations the export quota allowed for 1935—exclusive of carry-over from 1934—was 274,320 tons, of which 159,953 tons were allotted to the estates and 114,367 tons to the native growers. After making all adjustments for carry-over and for purchase of export rights from estates by Government on behalf of the native growers, it has been found that the export of estate rubber in 1935 was 1 ton short of the allotted quota and the export of native rubber 19,042 tons in excess.

Coffee.

The planted area on estates was 120,433 hectares and the area of native plantations in Java, 23,042 hectares; the area of the native plantations in the Outer Provinces is not known. Estate production was 55,307 tons and the export of native-grown coffee from the Outer Provinces was 55,640 tons. The total is 110,947 tons as against an average of 113,250 tons for the period 1931-35. The bulk of the production is Robusta coffee.

Tea.

The planted area on estates was 138,231 hectares, of which 104,415 in Java and 33,816 in Sumatra, and of which 102,135 and 32,982 hectares respectively—total 135,117 hectares—were in bearing. No native tea is grown outside Java. In Java the planted native area is 60,220 hectares of which 58,489 hectares were in bearing.

The total quantity of estate produce, including 12,622 tons native-grown leaf bought by estates and factories, was 71,360 tons, representing a value of Gs. 2,745,787.

Tobacco.

The particular features of this cultivation and of the preparation for export have already been fully described in this Journal*.

Cultivation of superior grades of leaf for cigar wrappers, which is confined to the East Coast of Sumatra, has again been severely restricted, this time to about 45 per cent. of normal output. There the crop has amounted to 12,923 tons.

In Java and Madura, estate cultivation of cheaper grades and European-managed curing of purchased native-grown leaf produced a crop of 12,883 tons of "leaf tobacco" and 16,512 tons of crude tobacco.

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* *Malayan Agricultural Journal*, Vol. XXII, No. 2, February, 1934.

In addition to this, there is a large native output for home consumption as well as for export. The latter in 1935 was estimated at 14,334 tons only, whereas in peak years it is very near the 40,000 tons mark.

Cinchona.

In spite of all foreign attempts at establishment of cinchona cultivation, the Netherlands Indies remain the principal producers. In 1935 the estate production in Java was 7,100 tons—including 33 tons made from native-grown produce—and of the Outer Provinces 1,507 tons; total 8,607 tons. The Netherlands Indies in 1935 produced 91 per cent. of the entire known world production of 9,346 tons.

Oil Palms.

In spite of adverse conditions production has further increased greatly, as the following table shows.

Table I.

Oil Palm: Areas and Production.

Year	Estates	Planted Areas. Hectares				Production. Kgs.		Export. Kgs.	
		Java	Outer Prov.	Total	In bearing	Kernels	Oil	Kernels	Palm Oil and Kernel Oil
1931	51	705	67,725	68,430	36,322	12,805,305	64,457,238	12,200,201	61,387,360
1932	50	710	69,365	70,075	43,833	18,413,577	90,072,649	17,884,341	84,973,111
1933	50	762	71,319	72,081	50,319	22,804,790	112,153,520	23,100,106	116,263,614
1934	50	736	73,093	73,829	55,740	24,878,483	130,646,781	25,068,446	121,261,680
1935	60	783	74,136	74,919	62,337	30,614,808	147,634,242	30,622,094	143,190,801

A striking feature of this table is that whereas during this period the area in bearing increased by only 70 per cent., production and export increased by 130 to 150 per cent.

The yield of palm oil per unit of area in bearing has increased greatly as is shewn by Table II.

The Netherlands Indies contribution to world exports in 1935 was 4.6 per cent. for kernels, and 34.8 for palm oil.

Coconuts.

The estate area in bearing is: Java 6,082 hectares and Outer Provinces 36,449 hectares, total production from these sources being 31,029 tons of copra equivalent.

Native production in Java and Madura, though large, at its best leaves only a small surplus available for export; sometimes it is insufficient to satisfy requirements for domestic consumption, in which case Java imports nuts and copra from

Table II.

Yield of Palm Oil per hectare in the Principal Centres.

Year	South Sumatra			North Sumatra		
	Area in bearing Hectares	Total production Kgs.	Yield per hectare Kgs.	Area in bearing Hectares	Total production Kgs.	Yield per hectare Kgs.
1931	2,018	3,344,202	1,657	34,018	60,948,533	1,792
1932	2,018	4,413,620	2,187	41,526	85,490,469	2,059
1933	2,102	6,192,250	2,946	47,552	105,728,934	2,223
1934	2,705	5,965,817	2,205	52,132*	124,481,035	2,409
1935	2,819	5,983,556	2,124	58,590	141,210,171	2,410

* 467 hectares not harvested.

the Outer Provinces. In 1935 there was an import surplus of 12,150 tons copra equivalent. The native production of copra in Java and Madura for the local oil-milling factories cannot be determined accurately, but is estimated to have been 158,600 tons out of a total of 173,443 tons milled, which includes part of the estate production and of copra imports. These figures do not include consumption of nuts for culinary purposes and by the small native village oil millers.

The export surplus from the Outer Provinces in 1935 rose to 481,687 tons of copra, of which estate production accounted for 26,615 tons.

The total 1935 export of copra, oil and coconuts combined from the Netherlands Indies amounted to 499,570 tons copra equivalent.*

Essential Oils.

Citronella grass is still the only cultivated crop of this kind of any importance. The planted estate area is given as 8,539 hectares, of which 7,245 in bearing, and the native area in Java as 15,310 hectares of which 13,386 hectares in bearing. Area and production figures, however, are admittedly incomplete, as exports always greatly exceed the known production. For 1935 these figures were respectively 1,664,012 and 709,348 kilograms of oil.

Exports of other essential oils in 1935 were (in kilograms): cajaput oil 54,725, ylang-ylang oil 17,048, vetiver oil 13,137 and patchouli oil 2,301.

* Basis of conversion: 4,300 nuts = 1 metric ton of copra and 1,000 litres of oil = 220 gallons = 1.5057 metric tons of copra. 100 kilos. of oil = 1.673 metric tons of copra.

Hard-rope Fibres.

This product is chiefly sisal fibre, grown on estates. The total export in 1935 was 92,346 tons, compared with 69,672 tons in 1934.

Kapok.

This crop is nearly entirely native grown and the cleaning of the fibre from the pod is largely a village industry. The 1935 total exports were:

	Fibre	Seeds	Oil	Oil-cake	
	25,653	17,199	4,373	12,060	tons,
of which estate-produce	2,293	4,306	—	—	tons.

Only *Ceiba pentandra* L. Gaertn. is cultivated.

Cocoa.

The total estate area planted increased from 5,823 hectares in 1934 to 6,237 hectares in 1935, and estate production rose correspondingly from 1,600 to 1,729 tons. Total exports, however, fell from 2,093 tons in 1934 to 1,576 tons in 1935.

Pepper.

Cultivation is nearly entirely in the hands of native and Chinese growers. The 1935 exports were:—

		Black	White	Total	
Sumatra	...	45,513	803	46,316	tons
Banka and Billiton	...	1,409	10,634	12,043	,,
Borneo	...	188	2,084	2,272	,,
		47,110	13,521	60,631	tons

A curious feature of the table, given below, is that, whereas the production of—and obviously also the demand for—white pepper does not on the whole seem to fluctuate much, the export of black pepper from the Netherlands Indies has been nearly trebled in the last 5 years.

	Black Pepper	White Pepper	Total Pepper Exports	
1931 ...	17,375	14,239	31,614	tons
1932 ...	20,242	15,931	36,173	,,
1933 ...	28,493	15,696	44,189	,,
1934 ...	26,550	22,015	48,565	,,
1935 ...	47,110	13,521	60,631	,,

The Report mentions the fact that the exceptionally large Sumatran crop of black pepper was fairly easily disposed of, whereas a large part of the crop of white pepper remained unshipped.

Tapioca.

This is mainly a crop planted by the natives for home consumption and a small surplus only remains available in various forms.

For the period 1931-1935—of which 1935 showed the largest planted area and the largest production—the averages have been: planted area 733,400 hectares, production 6,020,200 tons of fresh tubers, export surplus 466,800 tons, which show that, on an average, only 7.75 per cent. of the entire production—practically confined to Java—is available for export.

To the figures for planted area and production those relating to estate cultivation for flour manufacture have to be added, but they are relatively unimportant, incomplete and inaccurate, because many of these factories also mill native-grown tubers.

The exports of cassava products in 1935 were: dried tubers 35,720 tons; dried and ground 5,053 tons; flour 100,276 tons; flake and siftings 5,199 tons; pearl and seed 10,584 tons; fibre residue 886 tons.

Coca.

This is exclusively an estate crop and is exported as leaf. Production in 1935 was 124,347 kgs. of leaf.

Gambier.

This crop is not cultivated in Java which receives its requirements from Sumatra, Borneo and Rhio. Native consumption in the producing regions is unknown. The total net export from the Outer Provinces is stated to have been 12,930 tons, 5,776 tons of which were consumed in Java. Estate production is stated to have been 2,991 tons.

Arecanut.

This is entirely a native crop. Exports in 1935 from Java were 6,197 tons and from the Outer Provinces 41,214 tons, total 47,411 tons.

Nutmegs.

Reliable figures are available only in respect of exports which in 1935 amounted to: shelled nuts 1,923 tons, unshelled nuts 2,142 tons, mace 612 tons. The chief producing area is the Banda Islands group, which supplies the bulk of the exports: the bulk of the production from other islands in the Moluccas and from Celebes and Mid-Java is consumed within the Netherlands Indies.

Cloves.

The total export of all producing regions within the Netherlands Indies to foreign countries is small; in 1935 it was 225 tons. Nearly the entire balance of the production goes to Java—478 tons out of 527 tons—which in 1935 imported 4,350 tons from foreign countries. The bulk of these remarkably heavy imports is consumed in Java as a flavouring of native tobacco.

Rice.

Java in 1935 exported 7,031 tons of its home-grown crop of 3,839,270 tons to countries outside the Netherlands Indies and the Outer Provinces 6,810 tons, total 13,841 tons.

In 1935 imports of foreign rice into Java amounted to 79,254 tons. According to these figures Java's import surplus is only 40,669 tons, equivalent to about 1 per cent. of its home-grown crop.

Maize.

Maize is exclusively a native crop for home consumption, except in Celebes which in 1935 exported 20,582 tons to foreign countries, 285 tons to Java and 354 tons to other regions within the Netherlands Indies. Its total export of 21,221 tons constitutes the bulk of the total exports of 23,720 tons of all the Outer Provinces taken together.

Of Java's 1935 crop of 1,989,200 tons, 61,808 tons, or 3.1 per cent. were exported to foreign countries in 1935.

Groundnuts.

Exports to foreign countries in 1935 amounted to 29,219 tons from Java and 2,035 tons from the Outer Provinces, total 31,254 tons.

Sago.

In the eastern parts of the Archipelago, sago is a staple food; the chief exporters are the East Coast of Sumatra and the Rhio Islands. In 1935 exports to foreign countries were 41,498 tons.

Potatoes.

Exports continue to decline and in 1935 were 1,916 tons as against 4,954 tons in the peak year 1932.

Onions.

This crop seems to become of greater importance; exports were:—

1931	1932	1933	1934	1935
1,371	522	1,962	1,746	3,599 tons

97 per cent. comes from Java.

Derris Root.

This is becoming established as a cultivation crop. Exports were:—

1931	1932	1933	1934	1935
12.5	3.5	20	136	318 tons

77 per cent. comes from Sumatra.

Miscellaneous Crops.

Amongst a number of crops of minor importance may be mentioned chillies, the exports of which were 1,873 tons, cotton 3,349 tons, sesamum 3,201 tons of a value of Gs. 227,000. Benzoin gum 2,188 tons, fresh vegetables 11,821 tons and fresh fruit 6,275 tons for the markets in British Malaya, dried fruits 7,824 tons.

L. A. J. R.
N. C. E. M.

Review.

The South American Potatoes and Their Breeding Value.

Imperial Bureau of Plant Genetics, School of Agriculture, Cambridge, England. September, 1936. Price three shillings and sixpence.

N.I.Vavilov, the head of the Institute of Plant Industry in Leningrad, evolved a method for extending the range of material for plant breeding. This method was based on the principle "that the number, range and variety of forms of a given plant increase as we approach the locality in which it has originated and from which its various forms have emerged", the place of origin being located "by tracing the distribution of its varieties and forms until the zone is found in which it reaches its maximum diversity; this zone is referred to as the centre of diversity or centre of origin".

"In these centres of origin it is often possible to find characters or combinations of characters entirely unknown in the particular plant in other areas, and it not infrequently happens that these characters are of economic importance, such as resistance to disease often found in so-called primitive forms at the centre of origin and nowhere else".

Applying this principle to the potato, expeditions were sent from Leningrad in 1925, 1926 and 1927 to investigate the home of the potato in Central and South America. Over a thousand specimens of local potatoes were collected of different types of plant and different forms and colours of tubers, and in place of one species of cultivated potato previously known, over a dozen locally cultivated were found, together with over thirty wild species.

The results of the work have, however, been published mainly in Russian and this bulletin issued by the Imperial Bureau of Plant Genetics can be considered as the first comprehensive account in English of one of the most remarkable advances ever made in plant breeding.

The bulletin deals with the collection of the material, its systematics and cytology, the origin and early history of the domestic potato, and certain applications of the new forms such as their value in breeding for blight and frost resistance, higher protein content and short dormancy.

The exploitation by the Russian breeders of the material gathered by their expeditions has given a great stimulus to potato breeding and has aroused world-wide interest not only amongst potato specialists but amongst all who are concerned with the application of modern research methods to the improvement of economic plants.

R. B. J.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

January, 1937.

The Weather.

Normal dry January weather obtained in Kedah throughout the month. In Province Wellesley and most parts of Perak and Selangor and in North Pahang the dry weather appeared to have set in earlier than usual, for during the first three weeks of the month little rain fell, but heavy showers occurred at many parts during the third week of the month. In Negri Sembilan the rainfall was above average at all stations from which records were received, although Malacca experienced the dry weather of the month usual in that Settlement.

Fairly frequent showers fell in most parts of Johore, and the fairly wet weather normal for the month obtained in Singapore. In Kelantan and the east coast of Pahang the weather was generally fairly dry with occasional light showers.

Remarks on Crops.

Padi.—In Kedah, harvesting proceeded under very favourable conditions.

In Province Wellesley, harvesting was commenced under favourable conditions, but the wet weather during the last week of the month rendered conditions less suitable.

In Krian, heavy rain at the end of the month interfered with the draining of the fields which had up to then proceeded satisfactorily. An average crop is expected in this District. In the Upper Perak and Kuala Kangsar Districts of Perak the crop is ripening and harvest has commenced. The crop appears to be well up to average. In the Sungei Manik area irrigation ceased on the 23rd January and draining of the fields was commenced. A fairly good crop is expected in Stage I.

In Selangor, harvesting is nearing completion in the inland Districts. Fairly serious rat damage occurred in the Tanjong Karang area.

In Negri Sembilan, harvesting was completed in Jelebu and is in progress elsewhere. A fair average crop is expected.

In Malacca, harvesting is general under good weather conditions and a good average crop is expected.

In Pahang, harvesting was completed in the Temerloh District early in the month and was practically completed in all the riverine mukims below Lipis at the end of the month. It is in progress in the riverine mukims above Lipis and has just commenced at Raub. Crop prospects are generally good.

In Kelantan, some of the earliest wet padi has commenced to flower and the harvesting of dry padi has commenced. Crop prospects are not very good for either the dry or wet padi.

Rubber.—The decline in price of the commodity which occurred in the Penang and Singapore markets during the month is not reflected in all monthly reports, which indicates that some dealers in rural districts were hoping for increased price quotations in the near future.

There is the usual variation in reports on the use of smoke cabinets in different localities. Thus, all cabinets erected in North Perak Circle were in use during the month, whilst none of those erected in Tanjong Malim Sub-district was utilized. At Sungei Selesik in Selangor, cabinet-smoked rubber sold for $42 a picul as compared with $39 for unsmoked sheet. In Brunei, eighteen cabinets were erected during the month bringing the total up to twenty-nine.

Reports indicate that there is a brisk demand in most localities for both coupons and uncouponed rubber and the prices of both appear to have either remained steady or fallen to a smaller proportionate degree than the price for couponed rubber.

Price quotations given in reports for coupons to cover a picul of rubber are $34.50 in Malacca, $28 to $31 in South Johore, $32.80 in North Johore, and $29.50 to $32.50 in the Batu Pahat District. The prices quoted per picul for uncouponed rubber are $12 to $13 in Malacca, $12 to $16 in South Johore according to locality, $16 in North Johore, and from $12 to $17 in Batu Pahat. In the Selangor report it is recorded that the combination of a fresh issue of coupons with a decline in price appears to have had opposite effects in two different areas. In Ulu Langat District the coupons are being held and uncouponed rubber sold, whereas in the Coast area the coupons are being sold outright.

Coconuts.—After the first week there was a decided decline in the price of copra from $10 to around $7.50 a picul. The decline was gradual at first but more marked during the second half of the month. Some copra makers in the Bagan Datoh area of Perak, obviously expecting a continued rise in copra prices, paid up to $42 a 1,000 for nuts, which is equivalent to $10.50 a picul for copra.

Steady progress in the erection of the new type smoke cabinet is reported from Johore and increased interest is being shown in them by growers in the Bagan Datoh area of Perak, especially in the Utan Melintang locality.

Agricultural Stations and Test Plots.

There is little of special interest to record this month in respect of Agricultural Stations. At Padi Stations and Test Plots harvesting is completed, in progress, or about to commence.

DEPARTMENTAL NOTES.

Leave.

Mr. F. C. Cooke, Chemist, Coconut Products, has been granted 6 months and 11 days leave on full pay with effect from the 30th January, 1937. During Mr. Cooke's absence, Major C. D. V. Georgi, Agricultural Chemist, will act as Chemist, Coconut Products, in addition to his own duties.

Mr. R. A. Altson returned from leave on the 14th January and resumed duty on the 15th January as Assistant Mycologist.

Mr. H. D. Meads returned from leave and resumed duty as Personal Assistant to the Adviser on Agriculture on the 29th January.

Mr. G. D. P. Olds relinquished duty as Personal Assistant on the 28th January and left Kuala Lumpur on the 4th February to proceed to Brunei to assume duty as Agricultural Officer, Brunei and Labuan.

ANTI - MALARIAL PRECAUTIONS.

Published at the request of the Malaria Advisory Board, F.M.S.

The Malaria Advisory Board invites the attention of planters to the danger to health likely to arise during the replanting of rubber, from the breeding of anopheline mosquitoes in pits left by the uprooting of trees and in holes prepared for replanting. Care should be taken to avoid the accumulation of water in such places, within half-a-mile of houses, as they may rapidly become the source of large numbers of *Anopheles maculatus* and other malaria-carrying mosquitoes.

Pits left by the uprooting of old trees should be filled up immediately. It is suggested that holes prepared for replanting, which are likely to become a source of mosquito breeding, should be kept *filled* with cut vegetation. Planting should, however, be undertaken as early as possible.

When fresh clearings are made care should be taken to avoid felling trees across ravines, as the fallen trees prevent access by oiling coolies to streams and drains. Where clearing is done on contract it may be necessary to insert a clause to this effect in the contract.

Statistical.

MARKET PRICES.

January, 1937.

Major Crops.

Rubber.—The price of the commodity remained moderately steady for the first half of the month then declined slightly, the price at the close of the month being 35⅝ cents. Spot loose opened in Singapore at 37⅝ cents per lb., and closed at 35⅝ cents per lb.

The average price for the month of No. 1 X Rubber Smoked Sheet was 36.47 cents per lb., as compared with 33.65 cents per lb., in December. The London average price was 10.38 pence per lb., and the New York price 21.26 cents gold as compared with 9.53 pence and 19.77 cents gold in December.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, January, 1937.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.			
	7	14	21	28	6	13	20	27	6	13	2C	27
Smoked sheet	47.10	47.56	46.10	43.00	45 .82	48.00	46.00	45.00	45.00			44.20
Unsmoked sheet	44.98	45.66	44.00			46.00			43.00	45.60	42.31	42.90
Scrap												

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

Palm Oil.—Prices for the Malayan commodity rose slightly during the month, but weakened again at the close, and are shewn in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1937.	Palm Oil in Bulk, c i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
January 1	£ 28. 10. 0	£ 17. 0. 0
,, 8	29. 0. 0	17. 0. 0
,, 15	30. 0. 0	17. 15. 0
,, 22	30. 0. 0	17. 5. 0
,, 29	28. 10. 0	16. 10. 0

Copra.—Prices advanced in the first half of the month and then showed a slight decrease. The sun-dried grade opened in Singapore at $9.50 per picul rising to $10.30 on the 14th January; it weakened to $7.50 on the 26th, improving slightly on the 28th, and closed at $7.70, with an average price for the month of $9.26 per picul as compared with $8.86 in December. The mixed grade averaged $9.01 per picul as compared with $8.57 in the previous month. Copra cake averaged $2.20 per picul as compared with $2 in December.

Rice.—The average wholesale prices of rice per picul in December were as follows:—Siam No. 2 (ordinary) $4.35, Rangoon No. 1 $3.47, Saigon No. 1 $3.92 as compared with $4.06, $3.47 and $3.72 respectively in November. The corresponding prices in December 1935 were $3.62, $3.57 and $3.32.

The average retail prices in cents per gantang of No. 2 Siam rice in December were: Singapore 28, Penang 31, Malacca 30 as compared with 26, 30 and 26 respectively in November.

The average declared trade value of imports of rice in December was $3.74 per picul as compared with $3.47 in November and $3.55 in October.

Padi.—The Government Rice Mills, Perak, were offering $1.90 per picul for padi, but no supplies were available during January. The retail price of padi in cents per gantang ranged from 7 to 14 cents.

Pineapples.—The prices per case of canned pineapples were:—Cubes $3.15, Sliced Flat $3.01, Sliced Tall $3.23.

Prices of fresh fruit per 100 were: Selangor 90 cents to $1.50; Johore 1st quality $4, 2nd quality $1.50 to $3, 3rd quality $1 to $2.

Beverages.

Tea.—Twelve consignments of Malayan tea were sold on the London market during January. Three consignments were of upland tea and averaged 1s. 1d., 1.1¼d., and 1s. 2d. per lb. One consignment of lowland tea sold for 11¾d. per lb. and the remaining consignments averaged from 1s. 0d. to 1s. 1¼d. per lb.

Average London prices per lb. during December for consignments of tea from other countries were as follows:—Ceylon 1s. 3.52d., Java 1s. 0.16d., Indian Northern 1s. 1.30d., Indian Southern 1s. 1.09d., Sumatra 10.96d.

The latest Colombo average prices available, quoted from the *Weekly Tea Market Report,* 26th January, 1937, of the Colombo Brokers' Association are as follows in rupee cents per lb.:—High Grown Teas 84 cents, Medium Grown Teas 74 cents, Low Grown Teas 71 cents.

Coffee.—The improvement in the price of coffee was maintained in the case of Sourabaya coffee which averaged from $16.88 to $18.19 per picul. Palembang coffee averaged from $13.16 to $14.19, as compared with the December respective averages of $15.16 to $16.31 and $12.38 to $13.88.

Spices.

Arecanuts.—The following are the averages of the ranges of Singapore prices per picul during January: Splits $5.62 to $8.44, Red Whole $5.75 to $7.38, Sliced $10.12 to $12.69.

The Singapore Chamber of Commerce quotations were: Best $7.65, Medium $7.00, Mixed $6.70 per picul.

Pepper.—On the whole, the market in Singapore was quiet during the month and there was little business passing. Average prices per picul were: Singapore Black $11.80, Singapore White $20.60, Muntok White $21.20 as compared with $10, $17.50 and $18.12 respectively in December.

Nutmegs.— Singapore prices started at $31 per picul for 110's and 80's then dropped to $30 remaining at that figure during the rest of the month. The average was $30.20 as compared with the December average of $30.

Mace.—Siouw remained steady at $100 but Amboina increased from $75 to $80 per picul during the month. The December average prices were $105 and $75 respectively.

Cloves.—The average price for both Zanzibar and Amboina for December was $43 per picul.

Cardamoms.—Green cardamoms were quoted during January in the Ceylon Chamber of Commerce reports at Rs. 2.15 to Rs. 2.25 per lb.

Miscellaneous.

Derris (Tuba Root).—Demand from the consuming countries was poor, but owing to scarcity of supplies and good speculative buying up-country, prices were higher than in December. Roots sold on a basis of rotenone content averaged $47 per picul, and on an ether extract basis $30 per picul.

Gambier.—Block improved to $7 per picul as compared with $6 in December and No. 1 Cube improved to $15 with an average of $13 per picul.

Tapioca.—Prices in Singapore remained unchanged: Flake Fair $5.50, Seed Pearl $5.75, Medium Pearl $6.50.

Sago.—Pearl averaged $5.02 per picul as compared with $4.60 for December. Flour, Sarawak Fair, averaged $3.53 per picul as compared with $3.06 in December.

Tobacco.—In Kelantan the price per picul of locally grown tobacco was: 1st quality $90, 2nd quality $75 to $85, 3rd quality $60 to $65. In Johore, the price of Javanese tobacco ranged from $40 to $95 per picul. In Kedah the range per picul was: 1st quality $47 to $48, 2nd quality $37 to $38, 3rd quality $27 to $28. The range of prices in other parts of the country was: 1st quality $20 to $35, 2nd quality $15 to $32, 3rd quality $10 to $23.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY.*

December, 1936.

Malaya.—Imports of foreign rice during December were 60,679† tons, and exports 15,616 tons, net imports being 45,063 tons. Net imports for the twelve months totalled 533,795 tons as compared with 470,384 tons in 1935¶.

Of the imports during December 1936, 50 per cent. were consigned to Singapore, 18 per cent. to Penang, 8 per cent. to Malacca, 16 per cent. to the Federated Malay States and 8 per cent. to the Unfederated Malay States. The imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 37,535 (61.9), Burma 20,153 (33.2), French Indo-China 2,253 (3.7), other countries 738 (1.2).

Of the December exports 69 per cent. were consigned to the Netherlands Indies and 31 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 13,227 (84.7), Burma 1,542 (9.9), French Indo-China 679 (4.3), parboiled 42 (0.3), local production 126 (0.8).

India and Burma.—According to the second rice forecast for All-India (*Indian Trade Journal* dated 31st December 1936) for the season 1936-37, the area under rice is estimated at 81,446,000 acres as against 80,736,000 acres (revised) for the corresponding season 1935-36, an increase of 710,000 acres or 1 per cent.

Siam.—Exports of rice and rice products from Bangkok during October were 149,067 tons, the total for the ten months was 1,381,101 tons as compared with 1,268,888 tons in 1935. A telegraphic report on rice conditions from 60 various provinces of Siam concludes as follows:—

Cultivated area: Up to the end of December, the area planted was approximately 7,313,620 acres compared with 7,918,032 acres in the previous year, a decrease of about 604,412 acres.

Damaged area: The damaged area is reported to be as much as 1,658,559 acres as against 946,608 acres at the same time last year.

Harvested area: About 2,291,826 acres have been harvested with approximate yields of 1,373,323 tons of padi. At the same period last year 2,765,345 acres had been harvested with approximate yields of 1,725,873 tons of padi.

Japan.—The latest information available was published in the General Rice Summary for November.

French Indo-China.—The total exports for the year amounted to 1,684,267 tons just 4 per cent. behind the record total of last year.

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* Abridged from the Rice Summary for November, 1936, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Tons = long tons (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1935.

The Netherlands Indies.—The latest information available was published in the General Rice Summary for November 1936.

Ceylon.—Imports from January to December 1936 totalled 520,939 tons as against 533,253 tons in 1935 a decrease of 2.3 per cent. Of the 1936 imports 14.1 per cent. were from British India, 63.2 per cent. from Burma, 0.4 per cent. from the Straits Settlements and 22.3 per cent. from other countries. The corresponding 1935 percentages were 12.8, 65.2, 0.8 and 21.2.

Europe and America.—Shipments from the East to Europe during the period 1st January to 3rd December totalled 1,262,461 tons as compared with 675,258 tons in 1935 an increase of 87 per cent. Of the 1936 shipments 23.9 per cent. were from Burma, nil from Japan, 66.1 per cent. from Saigon, 9.3 per cent. from Siam, and 0.7 per cent. from Bengal. In 1935 the corresponding percentages were 47.7, 3.5, 41.9, 5.3 and 1.6.

Shipments for the Levant from 1st January to 1st December were 13,541 tons, a decrease of 53.1 per cent. as compared with 28,895 tons in 1935. Shipments for Cuba, West Indies and America from 1st January to 19th November were 235,657 tons, as compared with 248,202 tons for 1935, a decrease of 5.1 per cent.

MALAYAN AGRICULTURAL EXPORTS, DECEMBER, 1936.

PRODUCT.	Net Exports in Tons			
	Year 1935	Year 1936	December 1935	December 1936
Arecanuts ...	21,885	26,548	2,248	1,602
Coconuts, fresh † ...	106,272†	114,314†	2,808†	6,821†
Coconut oil ...	35,911	46,507	3,905	3,352
Copra ...	111,752	76,681	16,297	7,099
Gambier, all kinds ...	2,837	2,188	180	176
Oil cakes ...	11,361	15,763	1,506	1,680
Palm kernels ...	3,892	4,964	355	290
Palm Oil ...	24,597	29,296	2,047	2,650
Pineapples canned ...	73,923	76,403	8,866	5,503
Rubber ¶ ...	378,381¶	365,005¶	25,322¶	32,944¶
Sago,—flour ...	10,920	6,992	2,430	406
,, —pearl ...	4,655	3,319	388	272
,, —raw ...	7,735*	7,484*	820*	616*
Tapioca,—flake ...	1,953	1,535	153	119
,, —flour ...	755*	2,418*	150*	462*
,, —pearl ...	17,169	17,797	1,479	1,765
Tuba root ...	567	600	48	34

† hundreds in number. * net imports. ¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS (IN LONG TONS)

(As declared by Estates)

Month 1936	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,395.4	326.5	258.6	37.2
February ...	1,531.9	372.4	244.2	54.6
March ...	1,878.4	534.5	302.9	88.0
April ...	1,410.6	446.8	250.0	80.0
May ...	1,346.1	644.8	238.1	114.6
June ...	1,557.4	658.3	245.5	100.9
July ...	2,270.5	975.7	349.1	147.6
August ...	2,963.2	1,029.0	419.2	163.0
September ...	2,671.5	969.9	394.2	136.9
October ...	2,312.3	928.6	434.6	133.0
November ...	1,917.2	462.0	314.5	82.0
December ...	1,826.7	1,463.8	340.1	202.9
Total ...	23,081.2	8,812.3	3,791.0	1,340.7
Total 1935 ...	17,338.7	5,764.6	2,711.1	818.4

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST DECEMBER, 1936.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1935	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (*a*)		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,526	400	0.9	15,240	34.2	475	1.1	15,640	35.1
Malacca	121,601	1,902	1.5	27,702	22.8	2,822	2.3	29,604	24.3
Penang Island	2,575	675	26.2	501	19.5	264	10.3	1,176	45.7
Singapore Island	34,525	5,105	14.8	8,222	23.8	334	1.0	13,327	38.6
Total S.S. ...	203,227	8,082	4.0	51,665	25.4	3,895	1.9	59,747	29.4
FEDERATED MALAY STATES :—									
Perak	294,988	9,424	3.2	63,356	21.5	13,324	4.5	72,780	24.7
Selangor	332,165	10,296	3.1	54,390	16.4	14,582	4.4	64,686	19.5
Negri Sembilan	258,304	8,534	3.3	50,511	19.6	16,043	6.2	59,045	22.9
Pahang	77,210	8,353	10.8	24,729	32.0	15,707	20.3	33,082	42.8
Total F.M.S. ...	962,667	36,607	3.8	192,986	20.0	59,656	6.2	229,593	23.8
UNFEDERATED MALAY STATES :—									
Johore	432,443	28,314	6.5	54,267	12.6	39,002	9.0	82,581	19.1
Kedah	199,607	14,699	7.4	25,326	12.7	15,329	7.7	40,025	20.1
Kelantan	30,474	403	1.3	8,961	29.4	3,830	12.6	9,364	30.7
Trengganu (*b*)	4,643	Nil	Nil	Nil	Nil	128	2.8	Nil	Nil
Perlis (*c*)	1,575	Nil	Nil	740	47.0	177	11.2	740	47.0
Brunei	6,010	Nil	Nil	1,577	26.2	922	15.3	1,577	26.2
Total U.M.S. ...	674,752	43,416	6.4	90,871	13.5	59,388	8.8	134,287	19.9
TOTAL MALAYA ...	1,840,646	88,105	4.8	335,522	18.2	122,939	6.7	423,627	23.0

Notes :—(*a*) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(*b*) Registered Companies only.
(*c*) Rendered quarterly.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF DECEMBER, 1936, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports during the month		Imports January to Nov. 1936		Exports including re-exports during the month		Exports including re-exports January to Nov. 1936		Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	January to Nov. 1936	during the month	January to Nov. 1936	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	January to Nov. 1936
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	5,379	11,968	12,579	125,005	3,918	62,596	Nil	Nil	Nil	Nil	10,026	5,556	139,219	48,537	...	3,682	14,568	12	119
Johore ...	...	2,558	4,241	4,886	50,187	3,564	38,939	Nil	114	Nil	905	1,949	6,548	27,030	61,989	...	1,750	5,116	...	...
Kedah ...	...	355	3,090	3,337	31,752	436	8,890	Nil	Nil	Nil	Nil	1,647	1,653	17,527	22,762	...	156	3,762	...	...
Perlis ...	...	18	14	16	140	5	220	Nil	Nil	Nil	Nil	Nil	31	Nil	362	...	1	21	...	...
Kelantan ...	...	417	261	297	3,440	216	6,613	Nil	Nil	Nil	Nil	154	553	1,769	8,351	...	189	295	...	...
Trengganu ...	...	55	50	205	2,649	103	1,325	Nil	Nil	Nil	Nil	Nil	308	Nil	3,974	...	55	50	...	...
Brunei ...	...	6	44	53	548	71	772	...	...	...	...	...	128	...	1,327	...	Nil	46	...	...
Total Malay States	...	8,788	19,668	21,373	213,721	8,313	119,355	Nil	114	Nil	905	13,776	14,777	185,545	147,302	...	5,833	23,858	12	119
S. SETTLEMENTS :—																				
Malacca ...	...	1,802	1,136	1,238	12,507	638	6,967	Nil		Nil		2,117		28,796		...	1,723	1,340	...	...
Province Wellesley ...	...	1,315	573	511	5,025	266	2,636	Nil		Nil		7,073		87,264		...	1,536	657	...	...
Penang ...	1,071	4,250	7	15	183	179	1,104	2,426	12,022	30,959	138,351		Nil		Nil	1,786	3,266	11	...	...
Singapore ...	5,724	15,716	166	150	1,682	242	1,630	7,306		136,096		15,748		218,537		7,166	14,751	178	26	316
Labuan ...	...	14	Nil	Nil	Nil	19	195	26		747		Nil		Nil		...	9	Nil	...	...
Total Straits Settlements ...	6,795	23,097	1,882	1,914	19,397	1,344	12,532	9,758	12,022	167,802	138,351	24,938	Nil	334,597	Nil	8,952	21,285	2,186	26	316
Total Malaya ...	6,795	31,885	21,550	23,287	233,118	9,657	131,887	9,758	12,136	167,802	139,256	38,714	14,777	520,142	147,302	8,952	27,118	26,044	38	435

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	2,700	14,381	3,143	3,015	1,486	51
WET RUBBER	982	370	123	253	264	105
TOTAL ...	3,682	14,751	3,266	3,268	1,750	156

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Nov. 1936
29	30	31
Singapore ...	24,204	329,322
Penang ...	10,282	127,988
Port Swettenham.	3,961	59,000
Malacca ...	267	3,832
MALAYA ...	38,714	520,142

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to Nov. 1936
32	33	34
Malay States ...	28,256	332,415
Straits Settlements	2,767	30,738
MALAYA ...	31,023	363,153

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i. e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 25th January, 1937.

METEOROLOGICAL SUMMARY, MALAYA, DECEMBER, 1936.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						Hrs.	Hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	90.5	71.7	81.1	93	67	85	74	83.4	84.3	7.98	202.7	2.25	19	16	8	7		173.55	5.60	47
Bukit Jeram, Selangor ...	87.4	71.8	79.6	91	69	84	74	82.8	84.7	11.50	292.1	1.78	20	19	4			204.65	6.60	55
Sitiawan, Perak ...	87.6	72.8	80.2	90	69	81	76	83.2	83.9	12.26	311.4	4.32	20	16		2		195.90	6.32	53
Temerloh, Pahang ...	85.7	71.8	78.7	90	68	77	75	83.1	84.5	6.70	170.2	1.10	18	17		10		157.35	5.07	43
Kuala Lipis, Pahang ...	85.9	70.9	78.4	91	66	74	74	82.0	83.3	8.62	218.9	2.08	23	21	1	22		143.35	4.62	39
Kuala Pahang, Pahang ...	83.3	74.3	78.8	86	71	79	80	80.7	82.5	19.09	484.9	4.26	26	23				157.45	5.08	43
Kallang Aerodrome, S'pore ...	85.3	74.5	79.9	88	72	80	77	81.1	82.6	10.62	269.7	3.07	20	15	4			162.45	5.24	43
Butterworth, Province Wellesley ...	87.8	73.1	80.5	90	70	83	75	83.9	84.9	7.65	194.3	2.28	15	12	3	1		209.50	6.76	57
Bayan Lepas Aerodrome Penang ...	87.3	73.9	80.6	90	70	81	76	82.8	83.4	5.97	151.7	1.37	14	12	2			222.85	7.19	61
Bukit China, Malacca ...	86.3	73.0	79.7	90	71	82	76	81.9	83.2	3.77	95.8	1.30	13	11	4			195.80	6.32	53
Kluang, Johore ...	86.6	71.3	78.9	91	68	77	74	80.8	81.9	10.61	269.5	4.50	19	14	2	9		172.35	5.56	46
Bukit Lalang, Mersing, Johore	82.7	72.7	77.7	86	70	78	78	80.0	80.3	15.49	393.5	3.40	20	17				180.50	5.82	49
Alor Star, Kedah ...	88.2	72.3	80.3	92	69	82	75	82.2	83.7	3.42	86.9	1.08	9	8		2		202.95	6.55	55
Kota Bahru, Kelantan ...	83.3	72.9	78.1	86	68	75	76	80.6	82.6	30.21	767.3	8.30	27	25		1		150.30	4.85	41
Kuala Trengganu, Trengganu	83.0	73.6	78.3	86	68	76	77	79.7	80.5	29.38	746.3	5.86	29	22	1	2		145.95	4.71	40
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	70.6	61.1	65.9	77	51	64	64	70.6	71.2	13.03	331.0	2.28	27	26		24	1	87.15	2.81	24
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.6	57.1	64.3	75	49	65	63	68.9	69.5	11.33	287.8	2.12	24	20	1		5	115.65	3.73	31
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.1	58.8	64.9	77	56	67	61			10.82	274.8	1.98	23	19	1		5	116.95	3.77	32

Compiled from Returns supplied by the Meteorological Branch, Malaya.